THE NEW HAMPSHIRE AMBIENT AIR MONITORING PROGRAM 2016/2017 ANNUAL NETWORK REVIEW and PLAN

NEW HAMPSHIRE
DEPARTMENT OF
**Environmental
Services**

THE NEW HAMPSHIRE AMBIENT AIR MONITORING PROGRAM 2016/2017 ANNUAL NETWORK REVIEW and PLAN

prepared by the
Air Monitoring Program

Thomas S. Burack, Commissioner
Clark Freise, Assistant Commissioner
Craig Wright, Air Resources Division Director

State of New Hampshire
Department of Environmental Services
Air Resources Division
29 Hazen Drive
Concord, NH 033020095
(603) 271-3503
www.des.nh.gov

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Introduction

The New Hampshire Department of Environmental Services (NHDES) is pleased to submit this 2016/2017 Ambient Air Monitoring Program Annual Network Review and Plan in accordance with the *Code of Federal Regulations Title 40, PART 58.* Part 1 of this Plan reviews structure, objectives, history and data trends associated with NHDES' Air Monitoring Program (AMP). Part 2 of this Plan details individual air monitoring station information.

PART 1 – 2016/2017 Annual Network Review and Plan

NHDES continually revisits and stresses basic air monitoring fundamentals and efficiency initiatives to allow for reliable, high quality data capture and analysis within a strained budget. Key objectives remain to provide quality ambient air data in order to:

- determine attainment status with the National Ambient Air Quality Standards (NAAQS, see Table 1.1),
- guide future air quality policy decisions at the state and national level, and
- protect public health through forecasting and real-time mapping and air pollution alert initiatives.

Tables 1.8 through 1.11, presented later in this section summarize the current status of the New Hampshire ambient air monitoring network – July 2015 through June 2016.

Monitoring Objectives

In accordance with the NHDES mission "to help sustain a high quality of life for all citizens by protecting and restoring the environment and public health in New Hampshire", NHDES operates a network of air monitoring sites throughout the state. These sites facilitate monitoring of ambient ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), volatile and semi-volatile organic compounds (VOCs), carbon monoxide (CO), lead (Pb) and particulate matter chemistry (PM, $PM_{2.5}$, PM_{10}). Air monitoring data from NHDES' network helps assess air quality within New Hampshire, evaluate the status of air quality coming from areas upwind and also helps assess our contribution to downwind areas. These data allow NHDES to predict air pollution episodes, enact protective actions and warnings, develop and assess effectiveness of emission reduction strategies and support health assessments and NAAQS reviews.

Ambient air pollution monitoring began in New Hampshire in the 1970s at a few locations. Over subsequent years, it grew to the point where each of the state's 10 counties hosted monitoring stations for air pollutants known to exist in the area. Over time, local industrial facilities either established pollution controls or shut down, resulting in improvements in air quality in those counties. For example, paper mills in Coos County emitted fairly high levels of sulfur dioxide and particles, resulting in periodic unhealthy air quality. Most of these facilities have since shut down and the air quality has improved to the point that there is no longer the need for monitoring in the area. Accordingly, NHDES has reallocated monitoring resources. However, NHDES continues to track emission inventories and reports of health

concerns in these areas in order to assess any potential need to reestablish air monitoring infrastructure. In recent years, NHDES has coordinated with the U.S. Environmental Protection Agency (EPA) to streamline the monitoring network in order to meet demands for ever increasing efficiency with limited resources. NHDES has given careful consideration to how the need for efficiency would affect network consolidation while maintaining adequate public protection and the ability to track progress.

The current New Hampshire ambient air monitoring network is carefully configured based on air pollution emission patterns to provide air quality data in populated areas, which are potentially at risk for unhealthy air quality of one or more pollutants. Most populated areas are represented by an air monitoring station unless previous monitoring has demonstrated that either the community is not at risk or can be adequately represented by a nearby monitor. NHDES also considered topography, geographic coverage and air pollution modeling in the current network design.

Now, in 2016, most of the major pollution sources that are in operation in New Hampshire are generally well controlled. Areas of continued concern are mobile and area sources where population density and highway networks are dense enough to multiply the emissions of relatively small individual sources hundreds of thousands of times over. The cumulative emissions are greatest in the southeastern portion of the state where population and highway densities are greatest. This region is generally bounded by the Massachusetts state line to the south, Nashua and Manchester to the west, Concord to the north, and Rochester and Portsmouth to the east. This same region is also the most exposed portion of the state to air pollution transport which generally crosses the southeastern part of the state from Southwest to the Northeast and along the New Hampshire coastline.

Pollutants of most concern in this area in 2016 include ozone, ozone precursors (nitrogen oxides (NOx) and VOCs), $PM_{2.5}$ and SO_2. The New Hampshire monitoring network is most dense in the southeastern portion of the state to reflect potential air quality concerns in heavily populated region with diverse geography. While the greatest risk of unhealthy air quality occurs in this portion of New Hampshire, unhealthy air quality events can occur anywhere in the state for ozone and small particles. Accordingly, the monitoring network for these pollutants extends into all portions of the state. Small particles also lead to visibility impairment, and there are federal regulations to track visibility progress with a special kind of speciation monitoring (IMPROVE) near the Class I airsheds (Great Gulf Wilderness and Presidential Dry-River Wilderness) located adjacent to Mt. Washington in northern New Hampshire.

As part of the 2010 1-hour SO_2 NAAQS implementation, EPA provided states with the option of performing additional source specific monitoring in support of attainment designation under the Data Requirements Rule (DRR). Beyond special study SO_2 monitoring completed in recent years in the Seacoast region, NHDES does not currently plan to conduct additional source specific SO_2 monitoring in the Seacoast region, or in any other part of the state as part of the DRR.

Network Summary

Below is a brief summary of the New Hampshire Air Monitoring network and the role each station plays for public protection. The list is presented alphabetically by community.

Concord

The Concord monitoring site is primarily intended to track ozone and sulfur dioxide, the only criteria pollutants for which recent air monitoring and modeling have indicated possible population exposure to unhealthy levels. A previous Concord monitoring station was located in the valley near I-93, but was moved to reduce the risks of NOx scavenging caused by nearby freeway traffic emissions and effectively lowering the measured ozone levels in the immediate area. The Hazen Drive site has the advantage of being in close proximity to the NHDES main office, for both outreach opportunities and ease of maintenance. It is also in the proximity of residential neighborhoods, retirement communities and schools. NHDES initiated SO_2 monitoring at this station during October 2010 to help quantify local SO_2 levels relative to the new SO_2 NAAQS. This station represents population on a neighborhood scale.

Greens Grant – Mt. Washington base

The Greens Grant, Camp Dodge ozone monitor at the base of Mt. Washington is now the primary monitor representing the northern portion of New Hampshire. NHDES contracts with the Appalachian Mountain Club for general support and operation of the ozone monitoring at this station. This monitoring location is also important since it represents two federally recognized Class I airsheds that also require IMPROVE visibility monitoring. Personnel from the United States Forest Service's White Mountain National Forest operate the IMPROVE sampler. NHDES tracks $PM_{2.5}$ levels measured by the IMPROVE monitor for the purpose of estimating current exposures and the demand for more comprehensive $PM_{2.5}$ monitoring. NHDES consolidated previous monitoring in the North Country (Pittsburg and Conway) at Camp Dodge due to the high correlation between sites, low population densities, and low risk of exposure to unhealthy air quality. This research-oriented station also represents population exposure on a regional scale.

Keene

The monitoring station in the city of Keene tracks ozone and $PM_{2.5}$ on a continuous basis. The southwest portion of the state experiences a few days per year when ozone levels have the potential to reach unhealthy levels. Similarly, NHDES is concerned about $PM_{2.5}$ levels at this station, especially during the winter months. NHDES installed a continuous $PM_{2.5}$ monitor at this station in September 2007 to better track the risks of wintertime wood smoke buildup. Keene is a prime example of a city distinguished by the factors, such as population density, woodstove use, and valley topography that are necessary for these winter events. Other nearby communities may be similarly affected. The continuous $PM_{2.5}$ equipment has been invaluable in better understanding the winter $PM_{2.5}$ events and improving air pollution forecasts for the area. The data measured for ozone and non-winter $PM_{2.5}$ are considered valuable on a regional basis, and the data for winter $PM_{2.5}$ is considered non-regional. This station represents population exposure on a neighborhood scale.

Laconia

The Laconia monitor tracks ozone and PM$_{2.5}$ in the Lakes Region of the state. The population of this area swells during the summer months with tourists. The monitor represents the very northern edge of the Boston CMSA (combined metropolitan statistical area) and periodically experiences elevated ozone levels. This station represents population exposure on a regional scale.

Lebanon

The Lebanon monitoring station is sited to provide population- and regional-based monitoring for the Lebanon/White River Junction (VT) metropolitan area with information on regional ozone and PM$_{2.5}$. This site is also important since it represents the consolidation of the closed Claremont (ozone) and Haverhill (ozone and PM$_{2.5}$) monitoring stations. The station is located on a ridge at the Lebanon airport, just above the river valley. The site was chosen primarily to represent the regional exposure, and the station is important to the New Hampshire network for its geographic coverage. This station represents population exposure on a regional scale.

Londonderry

The Londonderry station came online January 1, 2011 as an NCore superstation measuring a wide selection of pollutants. NHDES worked closely with EPA to carefully select this site for its central proximity to the highly populated southeastern suburban portion of New Hampshire. The site has no nearby emission sources of significance, but lies in the air pollution transport corridor that crosses the southern portion of the state. The site is expected to track a number of potentially unhealthy ozone events each year. NHDES relocated photochemical assessment monitoring (PAMS) from Nashua to this station in April 2015. PAMS measures important precursors to the development of ozone. These precursors include a wide variety of volatile organic compounds and nitrogen oxides. Being a multi-parameter station located in an area representative of a large population living in the northern suburbs of Boston, as well as between the major population centers of Nashua and Manchester, the data collected at this site will be ideal for future research and health-related analysis. This station also pairs with the Pack Monadnock NCore station to give the low elevation perspective as compared to Pack Monadnock's high elevation data for similar air masses transported into the area. This station represents population exposure on a regional scale.

Mt. Washington – Summit

The Mt. Washington summit monitoring site is of special value for scientific research for tracking ozone transport. The summit is located at 6,288 feet above sea level and is far away from any significant pollution sources; thus it is ideal for picking up long-range pollution transport into the northern portion of the state. The data are often compared to the data collected at Greens Grant (Camp Dodge) located at the base of the mountain, just a few miles to the east, to give a vertical gradient perspective. Ozone levels measured at the summit are normally higher than measured at the base and occasionally reach unhealthy levels. This station provides valuable high elevation data on a regional scale but should not be considered representative of population exposure in nearby communities at lower elevation.

Nashua – Gilson Road

In recent years, the Nashua area has often seen the highest ozone concentrations in the state and there is an ongoing need to continue tracking ozone in this area. While this station is on the upwind side of the city of Nashua, it is critical to the network for tracking transport into the state and into the city of Nashua from the southwest. This station represents population exposure on a regional scale.

Peterborough, Pack Monadnock Mountain – Summit (Miller State Park)

NHDES has monitored several parameters at the Pack Monadnock station since 2002 and it became the state's second NCore site in 2011. The site's true value lies in the fact that it is located on a rural mountain top in the south-central portion of the state. At 2,288 feet above sea level, the station is ideally located to pick up the transport airflow from the heavily populated northeast urban corridor (Washington, D.C. to Boston, Mass.) and is at the northern terminus of the low-level jet that begins near the middle of Virginia. This non-population-based monitor does not have nearby sources of significance. This site measures a wide variety of pollutants, including PAMS ozone precursors, IMPROVE, ozone, and $PM_{2.5}$. Due to its location and elevation, NHDES considers this station to be of high scientific value for transport measurements on a regional scale. When paired with data collected at Londonderry, Peterborough PAMS and $PM_{2.5}$ data provide a critical high-low cross section for regional photochemical models.

Pembroke

The Pembroke monitoring station is located along the Merrimack River, just to the south of Merrimack Station power plant. The power plant is a large coal burning source that until recently caused relatively high levels of SO_2 at this monitor. While the power plant recently completed pollution control upgrades for SO_2, this station tracks progress in reducing emissions and measures exposure to SO_2 in a nearby community. This station represents population exposure to SO_2 on a local scale.

Portsmouth

The Portsmouth monitoring station is located on Peirce Island on the Piscataqua River just to the east of downtown Portsmouth. NHDES has been successful in establishing a long-term agreement for siting at its current location and has found the location to be suitable for tracking emissions from around the Portsmouth and Kittery (Maine) areas. The station also picks up some sea breeze ozone events that work their way up the river. This station represents population exposure on a limited regional scale.

Rye

The Rye Monitoring station is located at Odiorne State Park. Its purpose is primarily to track summertime ozone events brought ashore by sea breezes. Past experience monitoring ozone in Rye found that these events sometimes result in measurements of ozone among the highest in the state. These events affect the coastline area and rarely penetrate more than a few miles inland. The data from this site are of scientific interest for air pollution flow dynamics when compared with data from Portsmouth station. This station represents a specific and limited population along the New Hampshire coastline for these periodic high ozone events.

PM₂.₅ Beta Attenuation Federal Equivalency Method (FEM) Monitoring

NHDES operates several Met One 1020 BAMs and one API 602 BAM covering a total of five stations. To date, NHDES operates BAMs and Federal Reference Method (FRM) filter based samplers at Keene, Lebanon, Londonderry, Peterborough and Portsmouth stations. Please note the following relative to data comparability assessments (FEM vs FRM) and declaration of primary sampler type for each station. For more information, see data Comparability Assessments in Appendix A.

Keene - The Met One 1020 BAM at Keene will remain primary toward the NAAQS. Any FRM data generated at Keene will be considered secondary when BAM data are available. In contrast to this decision, individual seasonal data comparisons are outside acceptability limits and all FRM and FEM data for the past three years (2013 – 1015) appear to fall outside additive vs. multiplicative bias acceptability limits for FEM testing. These data sets correlate with an overall R^2 = 0.61 and an intercept of 2.8 micrograms per cubic meter (μg/m³). However, these data are significantly skewed based on one FRM outlier collected on January 12, 2015. NHDES flagged this data point as an outlier, but it is still being used to generate these statistics on EPA's data assessment tool. Due to this one outlier data point, the BAM to FRM correlation for all data in 2015 look -awry with an R^2 of 0.55 (Figure 1.2). However without that outlier (Figure 1.3) the 2015 data correlation looks much better with an R^2 = 0.83. Adding to this positive trend, the September 2015 through March 2016 data sets correlate with an R^2 = 0.92 –and the January through March 2016 data sets correlate even stronger with an R^2 = 0.98 (Figures 1 and 1.5, respectively). Due to these positive trends with the FRM to FEM correlations, NHDES believes that the BAM should remain primary at Keene.

Lebanon - The Met One 1020 BAM at Lebanon will remain primary toward the NAAQS. Any FRM data generated at Lebanon will be considered secondary when BAM data are available. The 2013 yearly data set is outside additive vs. multiplicative bias acceptability limits. However, the 2014 data set is very close to these acceptability limits – and – the 2015 data set is within these acceptability limits. When looking at the complete data set, the FRM and FEM data for the past three years falls very close to the additive vs. multiplicative bias acceptability limits for FEM testing. These three years of data correlate with an overall R^2 = 0.77 and an intercept of -0.3 μg/m³.

Londonderry – NHDES requests that the Met One 1020 BAM regain its status as the primary PM2.5 sampler in Londonderry starting in January 2016. NHDES had requested that the PQ200 (FRM) be the primary sampler for 2015 due to poor correlations between the FRM and FEM at this station for the three prior years (2012 – 2014). However, after a review of the most recent FEM to FRM correlations at this site, NHDES has confidence that the FEM data is more FRM like and can be used as primary toward the NAAQS. Key elements of this decision include annual data sets that get progressively closer to acceptable additive and multiplicative bias every year (see Comparability Assessments in Appendix A) – and – a strong correlation of the most recent FRM to FEM data. These data, for the first quarter of 2016, compare well with an R2 = 0.88 and an intercept of -0.88.

Peterborough, Pack Monadnock Mountain – Summit (Miller State Park) - The Met One 1020 BAM at Peterborough will remain primary toward the NAAQS. Any FRM data generated at Peterborough will be considered secondary when BAM data are available. All valid FRM and FEM data sets from Peterborough for the past three years are very close to additive vs. multiplicative bias acceptability limits for FEM testing, except the winter data (see Comparability Assessments in Appendix A). This three-year data set correlates with an overall R^2 = 0.72 and an intercept of +2.87µg/m^3.

Portsmouth - API 602 BAM data at Portsmouth will be primary toward the NAAQS. Any FRM data generated at this station will be considered secondary when BAM data are available. The API 602 BAM has correlated quite well with the FRM when operational. All valid FRM and API602 FEM data sets from Portsmouth for the past three years are well within or very close to additive vs. multiplicative bias acceptability limits for FEM testing. This three-year data set correlates with an overall R^2 = 0.92 and an intercept of -0.52 µg/m^3.

Figure 1.1: **Londonderry FRM vs FEM**
Jan - Mar 2016

$y = 0.7678x - 0.0084$
$R^2 = 0.8801$
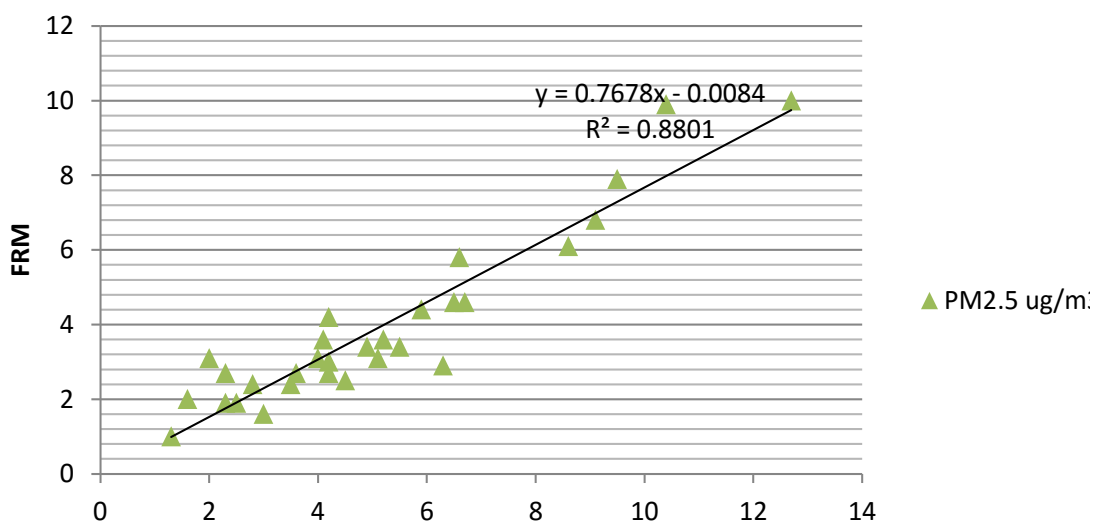
Figure 1.2 :

Keene FRM vs FEM
Jan - Dec 2015 All Data

$y = 1.0973x - 1.6446$
$R^2 = 0.5507$

▲ PM2.5 ug/m
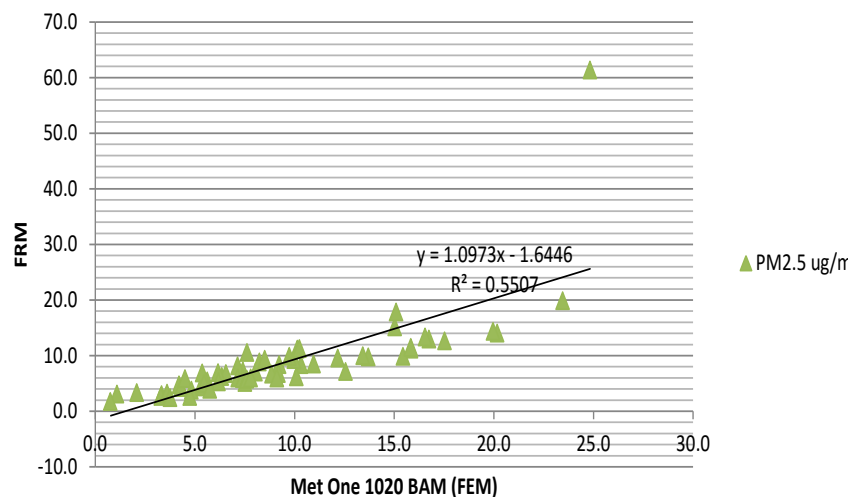
Figure 1.3 :

Keene FRM vs FEM
Jan - Dec 2015 W/O Outlier

$y = 0.71x + 1.2605$
$R^2 = 0.8263$

▲ PM2.5 ug/m
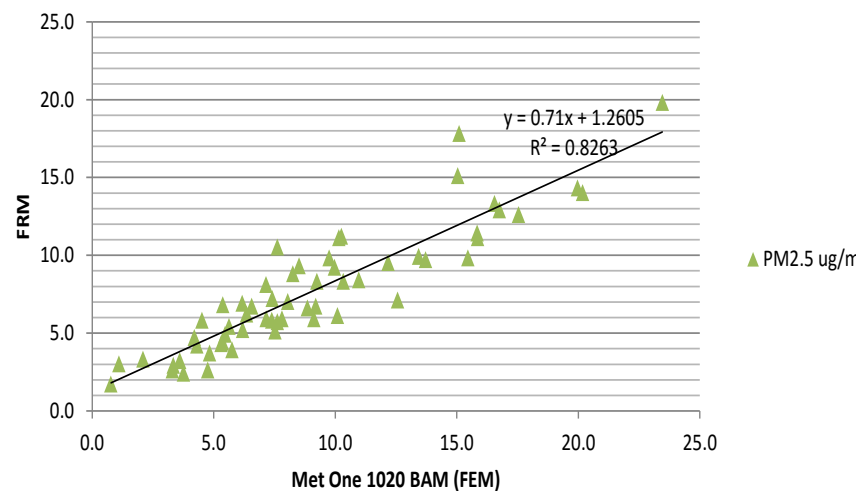
Figure 1.4:

Keene FRM vs FEM
Sept 2015 - Mar 2016

$y = 0.8038x + 0.1964$
$R^2 = 0.9233$

▲ PM2.5 ug/m
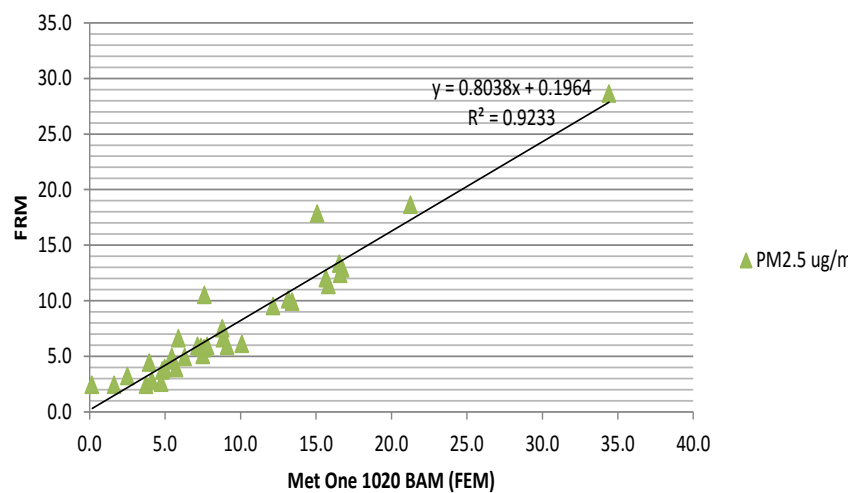
Figure 1.5 :

Keene FRM vs FEM
Jan - Mar 2016

$y = 0.7854x + 0.7013$
$R^2 = 0.9821$

▲ PM2.5 ug/m
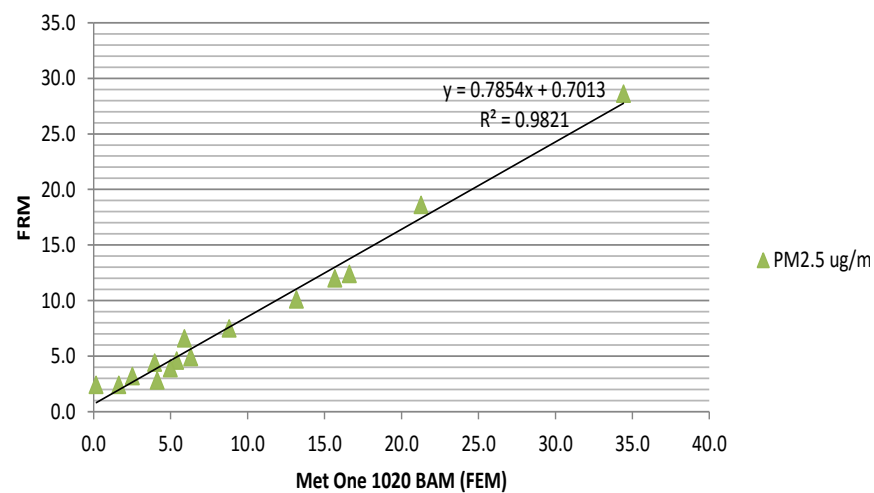
Network Modifications
NHDES made no significant modifications to the air monitoring network between July 1, 2015 and June 30, 2016.

Future Plans
In support of continuous efforts to improve performance and maximize network efficiency under a constrained budget, NHDES continues to seek efficiencies where possible within the network. As part of a Region I "monitoring collaborative" between EPA Region I staff and Region I state representatives, EPA summarized a number of cost-saving network suggestions to each state on May 16, 2016 in the form of an Excel spreadsheet. These network modification suggestions were based primarily on what states were monitoring that was not required by regulation. In accordance with this guidance, NHDES presents the following future plans.

Concord SO$_2$ – NHDES plans to discontinue SO$_2$ monitoring in Concord on December 31, 2016.

Laconia PM2.5 – NHDES plans to establish a temporary winter PM2.5 monitoring platform near downtown Laconia during the 2016-2017 winter season. Mobile monitoring conducted in 2012 indicated that there may be higher particle concentrations closer to the center of Laconia than where the FRM monitor is currently located. (also see Plymouth PM2.5 below)

Londonderry PM10 and Lead – In accordance with recent modifications to 40 CFR Part 58, NHDES plans to discontinue lead monitoring at the Londonderry station on June 30, 2016. These modifications allow states to request discontinuation of urban NCORE sites currently measuring low concentrations of lead (by PM10) for at least three years. Lead data and design values from this station continue to be significantly below the NAAQS. In conjunction with discontinuing lead monitoring, NHDES plans to discontinue filter based PM10 monitoring – and – install and operate a continuous (hourly) PM10 Met One BAM.

Plymouth PM2.5 – NHDES plans to establish a temporary winter PM2.5 monitoring platform near downtown Plymouth during the 2016-2017 winter season. Mobile monitoring conducted in 2012 indicated that there may be particle concentrations of concern in Plymouth during winter inversion events.

Portsmouth PM10 – NHDES plans to discontinue the filter based PM10 sampling at this station on December 31, 2016. NHDES will continue to collect PM10 data with the API602 continuous BAM and operate a filter based PM10 on a 12 day schedule as a colocation check for the BAM.

Purchasing/Expenses
NHDES' budget cycle runs from July 1 through June 30 each year. The Air Monitoring Program received one-time funding through the New Hampshire Capital Budget for equipment procurement during this budget cycle. In order to start the much-needed process of updating antiquated equipment in the Air Monitoring Program, NHDES procured 4 ozone

analyzers, 1 NOy analyzer, 1 beta attenuation monitor, 3 flow standards, 2 filter based particle samplers, 3 data loggers, 2 dilution calibrators and 2 zero air generators with these Capital Budget funds.

NHDES utilized most federal funding for air monitoring for personnel, consumables, parts and supplies to operate the air monitoring network. Additionally, NHDES maintains fleet vehicles, updates maintenance and station contracts, pays utilities for existing facilities, and enhances air monitoring stations as needed throughout the network. Other key expenses include calibrating, repairing, and maintaining equipment to meet EPA and safety standards.

Please note that a number of analyzers and samplers in NHDES' network are old and require frequent maintenance in order to assure adequate data capture. Of note, most of NHDES' filter-based particle samplers are near the end of their lifetime. Table 1.0 presents equipment, analyzers and samplers that NHDES currently uses for ambient air quality monitoring.

Table 1.0 : Equipment – (Method)
SO_2
Teledyne – API 100A and EU – (Automated Equivalent Method EQSA-0495-100)
Teco 43A – (Automated Equivalent Method EQSA-0486-060)
Teco 43C – (Automated Equivalent Method EQSA-0486-060)
Thermo 43i – (Automated Equivalent Method EQSA-0486-060)
CO
Teco 48C - (Automated Reference Method RFCA-0981-054)
Thermo 48i – (Automated Reference Method RFCA-0981-054)
Teledyne – API 300 EU – (Automated Equivalent Method RFCA-1093-093)
O_3
Teledyne – API 400E - (Automated Equivalent Method EQOA-0992-087)
Teco 49 - (Automated Equivalent Method EQOA-0880-047)
Teco 49C - (Automated Equivalent Method EQOA-0880-047)
Thermo 49i - (Automated Equivalent Method EQOA-0880-047)
Teco 49C PS – (Lab Standard EQOA-0880-047)
NO_2
Teledyne – API 200E – (Automated Reference Method RFNA-0691-082)
Teco 42C – (Automated Reference Method: RFNA-1289-074)
Thermo 42i – (Automated Reference Method RFNA-1289-074)
NOy
Ecotech Model 9843 NOy
Particulate Matter
R&P Partisol Model 2025 (filter based)
BGI Model PQ200 (filter based)
Met One BAM Model 1020
API 602 BAM
IMPROVE Visibility Speciation Monitor
Calibrator (multiple parameter)

Table 1.0 : Equipment – (Method)
TECO 165 Multi Gas Calibrator
Teledyne – API Model 700, 700E and 700U Gas Calibrators
Environics Series 6103 Multi Gas Calibrator
Data Acquisition System
Environmental Systems Corporation (ESC and Agilaire) Data Loggers Models 8816, 8832 and 8872
PAMS
Perkin Elmer Ozone Precursor System- Clarus 500 Gas Chromatograph, TurboMatrix 100 Thermal Desorber / TM50
Perkin Elmer Total Chrome Software- version 6.2.1
Parker Balston TOC Gas Generator
Parker Balston Hydrogen Generator

Personnel

The AMP continues to operate with one full-time technical position vacant as well as one technical position previously eliminated. Due to limited budget, NHDES is unable to fill the vacant position during the next year. In order to fulfill requirements, NHDES assigns some technical support duties to individuals outside the official AMP organizational structure, including continuous $PM_{2.5}$ management and PAMS management duties which are supported by the Atmospheric Science and Analysis section of the Air Resources Division, as illustrated in Figure 1.6.

Figure 1.6: Current Air Monitoring Program Organizational Chart
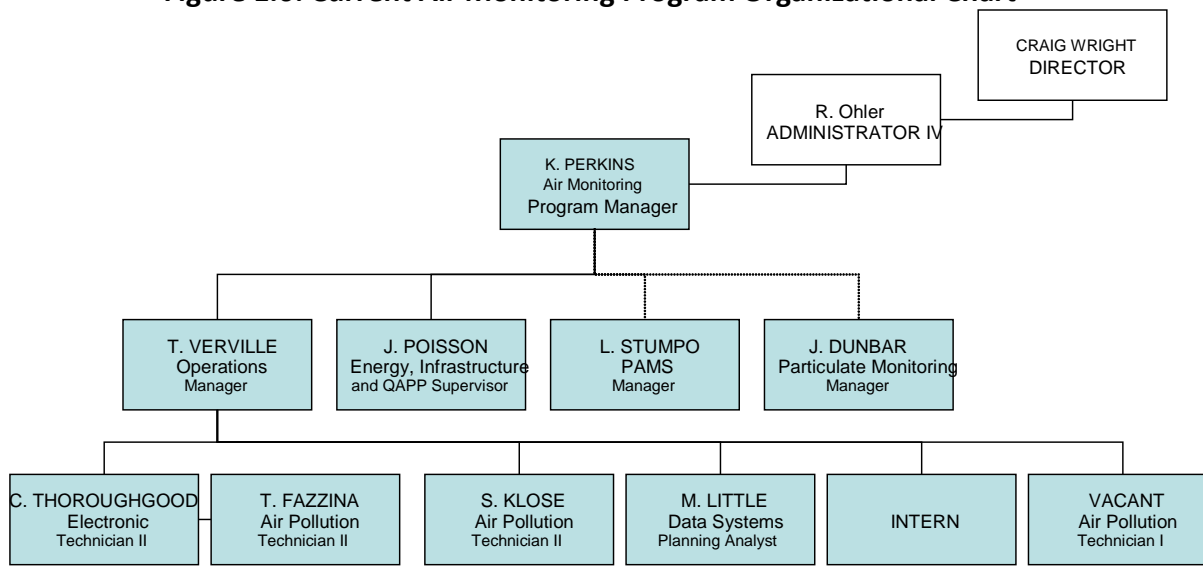
Cooperative Air Monitoring Initiatives

NHDES is involved in numerous cooperative air monitoring initiatives with local, state and private entities.

For over 25 years now, the Appalachian Mountain Club (AMC) and NHDES have been joining resources to conduct ozone monitoring in Coos County. Since 1990, AMC and NHDES have been cooperatively monitoring ozone on the summit of Mount Washington to determine the

exposure of hikers and other visitors to this pollutant and to quantify ozone transport from upwind areas. Significant levels of ozone have been measured on the summit during the summer months throughout this time. Also, AMC and NHDES began cooperatively managing a second monitoring station near the base of Mount Washington (Camp Dodge) in 1996, a White Mountain National Forest Class I Wilderness visibility monitoring station. AMC's involvement in air monitoring activities saves NHDES significant resources.

NHDES also partners with the United States Department of Agriculture (Forest Service) in a Challenge Cost Share Agreement relative to air monitoring activities at Camp Dodge in Green's Grant. This agreement provides a framework of cooperation for station work such as upgrades, tree trimming and routine costs. The Forest Service operates an IMPROVE (Interagency Monitoring of Protected Visual Environments) sampler at this station. NHDES and AMC currently maintain ozone sampling, upkeep, and routine site inspections at this station.

NHDES provides critical real-time rainfall data from the Laconia station for the protection of public health. When rainfall at the Laconia station exceeds a specific amount over a specific time period, an automated notification system operated by NHDES facilitates closing of a public beach and alerts of possible bacterial dangers. Similar notification systems incorporating our real-time meteorology data have been used to enact erosion control inspections at various New Hampshire Department of Transportation road construction projects.

NHDES maintains a near real-time air quality and forecasting website at (http://www2.des.state.nh.us/airdata/default.asp) and contributes to a regional air quality website maintained by EPA (http://www.epa.gov/region01/airquality/fc-ne0.html). These sites provide forecast information on New Hampshire's air quality that can be used by media, medical professionals, schools and athletic coaches, as well as individuals, to help plan daily activities and protect public health. The air quality forecast for New Hampshire is also available on the NHDES' Air Quality Information Line at (800) 935-SMOG. The forecast is made for ground-level ozone and particle pollution.

Monitoring Trends
Each year, NHDES reviews its monitoring data and calculates design values for comparison to the National Ambient Air Quality Standards (NAAQS) – Table 1.1. EPA establishes these standards to protect public health and welfare. In general, design values consider the three most recent years for an averaging period in the form of the NAAQS, such as looking at the three-year average of the annual fourth highest ozone 8-hour value.

New Hampshire air quality data trends reveal the important progress that has been made in improving air quality in New Hampshire. Cleaner vehicles, fuels, power plants, industry and small engines located throughout the region have all contributed to much-improved air quality since the 1980s. More recent trends show that additional progress is still being made, but the task becomes more difficult as there are becoming fewer pollution sources that remain uncontrolled. It is also important to note that while progress has been made,

the NAAQS have been lowered in some cases to be more protective, thus we have more progress to make.

Figures 1.7 through 1.20 present monitoring trends for the key criteria pollutants for the period 2000 through 2015. In all cases, air quality is significantly improved from the 1970s and 1980s. Currently monitored levels of nitrogen dioxide (NO_2), PM_{10}, lead (Pb) and carbon monoxide (CO) are safely below the current levels of the NAAQS. However, the NAAQS for ozone, $PM_{2.5}$, and SO_2 have all recently been tightened (lowered) to levels near what is currently being measured in New Hampshire. Two of these pollutants (ozone and $PM_{2.5}$) have drawn significant attention by NHDES as a focus for network monitoring and SIP planning. For SO_2, 1-hour NAAQS was recently added with a threshold of 0.075 parts per million (ppm), and NHDES is assessing its monitoring focus on a source-specific basis in order to address attainment requirements.

Existing SO_2 monitoring indicates that all areas of New Hampshire meet the 3-hour sulfur dioxide secondary NAAQS. Monitoring also indicates that Londonderry[1], Pack Monadnock, Manchester and Portsmouth are below the new 1-hour primary SO_2 NAAQS. The Pembroke monitoring station historically measured 1-hour SO_2 concentrations above the 0.075 ppm threshold until 2012. This station was sited as a source-specific monitor, located near a coal-burning power plant. In 2011 the power plant began operations of a new SO_2 scrubber which has significantly lowered its SO_2 emissions. As a result, the Pembroke monitor recorded a decrease from 57 daily maximum 1-hour SO_2 exceedances of 0.075 ppm in 2011 to just one exceedance of the same threshold in 2012 and none since 2013. Table 1.2 summarizes exceedances of NAAQS thresholds during recent years.

Tables 1.3 through 1.7 provide the maximum of the five most recent design values and most recent (2013-15) design values for each criteria pollutant. These are also expressed as percentages of the current NAAQS. CO, NO_2, and 1- and 3-hour SO_2 design values are all under 50% of the NAAQS during the 2013-15 design value period. The highest SO_2 site, Pembroke, last exceeded the 1-hour NAAQS for the period of 2011 to 2013, but now meets the standard. With the lower ozone standard of 0.075 ppm, Rye and Pack Monadnock summit just barely exceeded the standard during the period of 2007 to 2009, but since then these and all other sites have been under the standard, including during the 2013-2015 period.

In 2015, New Hampshire operated two Photochemical Assessment Monitoring Stations (PAMS): Pack Monadnock and Londonderry. Tables 1.12 and 1.13 show that none of the toxic PAMS parameters are near their Ambient Allowable Limits (AAL) at either site. Benzene has the lowest AAL, 5.7 μg/m3. At Londonderry and Pack Monadnock, the maximum 24-hour averages for benzene over the full period were about 0.2 and 0.4 μg/m^3, respectively, or about 4-7% of the AAL. Maximum values for all the other parameters for both sites are consistently less than 1% of their AAL.

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[1] Data capture for the 3rd quarter of 2013 was 67%, which is below the 75% data completeness requirement. Londonderry 2013 SO_2 data is presented in the chart based on data available and is believed to be a reliable representation as nearby SO_2 source emissions did not show unusual fluctuations during this period.

Table 1.1: National Ambient Air Quality Standards

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 µg/m^3 [1]	Not to be exceeded
Nitrogen Dioxide (NO$_2$)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb [2]	Annual Mean
Ozone (O$_3$)		primary and secondary	8 hours	0.070 ppm [3]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	PM$_{2.5}$	primary	1 year	12.0 µg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	PM$_{10}$	primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO$_2$)		primary	1 hour	75 ppb [4]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)), A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

Table 1.2: NAAQS Exceedances (Days) in New Hampshire (2010-2015)

Parameter/Location/Standard	Number of Exceedances						Most Recent
	2010	2011	2012	2013	2014	2015	
CO							
1-Hour (1971 standard)	0	0	0	0	0	0	1978
8-Hour (1971 standard)	0	0	0	0	0	0	1996
Lead							
Quarterly (2008 standard)	0	0	0	0	0	0	None
NO$_2$							
1-Hour (2010 standard)	0	0	0	0	0	0	1999
Ozone							
8-Hour (2015 standard)							
Camp Dodge	0	0	0	0	0	0	2009
Concord	2	0	1	0	1	1	2015
Keene	0	0	1	0	1	0	2014
Laconia	3	0	0	0	0	0	2010
Lebanon	0	0	0	0	1	0	2014
Londonderry	--	1	3	0	1	1	2015
Manchester	1	--	--	--	--	--	2010
Miller	8	3	6	1	1	2	2015
Mt. Washington[1]	4	2	2	1	0	5	2015
Nashua	2	1	2	0	1	1	2015
Portsmouth	2	3	2	2	1	1	2015
Rye	3	2	2	1	3	1	2015
Woodstock	--	0	0	0	0	0	None
PM$_{10}$							
24-Hour (1987 standard)	0	0	0	0	0	0	1989
PM$_{2.5}$							
Annual (2012 standard)	0	0	0	0	0	0	None
24-Hour (2006 standard)							
Keene	1*	4*	1*	3*	0*	0*	2013
Laconia	0	0	0	0	0	0	2005
Lebanon	0*	0*	0*	0*	0*	0*	None
Miller	0*	0*	0*	0*	0*	0*	2002
Nashua	0	0	0	0	0	--	2007
Pembroke	1	0	0	0	0	--	2010
Portsmouth	1*^	0*	0*	0*	0*	0*	2010
SO$_2$							
Annual (1971 standard)	0	0	0	0	0	0	None
1-Hour (2010 standard)							
Concord	--	5	0	0	0	0	2011
Londonderry	--	0	0	0	0	0	None
Manchester	1	1	--	--	--	--	2011
Miller	--	0	0	0	0	0	None
Pembroke	95	57	1	0	0	0	2012
Portsmouth	0	0	0	0	0	0	2008

* - Denotes measured by FEM equipment; otherwise measured by FRM method. ^ - Denotes exceptional event.

Station startups/closures: Manchester closed in 2011; Nashua (PM$_{2.5}$) and Pembroke (PM$_{2.5}$) shut down in 2015; Londonderry opened January 1, 2011; Concord station began SO$_2$ monitoring in 2011.

[1] Mt. Washington ozone exceedances exclude the second of overlapping 8-hour periods (ie. those beginning hours 00:00-06:00) per the 2015 standard final rule; the 2015 count also includes an exceedance in October, outside the ozone season. Please note: the state totals using these counts differ from those found at https://www3.epa.gov/region1/airquality/standard.html for unknown reasons.

Table 1.3: 2013 – 2015 Ozone Design Values (ppb)

Ozone	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2013-15 Max DV	% of NAAQS	Location
8-Hour	3-year average of 4th-highest daily maximum 8-hour averages	70	70	100	Peterborough (2009-11, 2010-12, 2012-14) Mt. Wash. (2010-12)	69	99	Mt. Wash.

Table 1.4: 2014 – 2015 Carbon Monoxide Design Values (ppm)

CO	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2014-15 Max DV	% of NAAQS	Location
1-Hour	2nd maximum over 2 years	35	3.2	9	Manchester (2010-11)	0.6	2	Londonderry
8-Hour	2nd maximum over 2 years	9	2.4	27	Manchester (2010-11)	0.5	6	Londonderry

Table 1.5: 2013 – 2015 Sulfur Dioxide Design Values (ppb)

SO$_2$	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2013-15 Max DV	% of NAAQS	Location
1-Hour	3-year average of 99th percentile of daily maximum 1-hour averages	75	221	295	Pembroke (2009-11)	29	39	Portsmouth
3-Hour	2nd maximum	500	193	39	Pembroke (2011)	27	5	Portsmouth

Table 1.6: 2013 – 2015 Nitrogen Dioxide Design Values (ppb)

NO$_2$	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2013-15 Max DV	% of NAAQS	Location
1-Hour	3-year average of 98th percentile of daily maximum 1-hour averages	100	11*	11*	Nashua (2009-11)*	--*	--*	--*
Annual	Annual average	53	3	6	Londonderry (2013-15)	3	6	Londonderry

* Only seasonal data are available for 2009-11 and 2010-12, and more recent design value periods are seasonally and annually incomplete.

Table 1.7: 2013 – 2015 Fine Particulate Matter Design Values (μg/m^3)

PM$_{2.5}$	Design Value (DV) Description	NAAQS	5-Year Max DV	% of NAAQS	Location	2013-15 Max DV	% of NAAQS	Location
24-Hour	3-year average of 98th percentile of midnight-to-midnight 24-hour averages	35	29	83	Keene (2009-11, 2011-13)	26	74	Keene
Annual	Annual average over 3 years	12	9.6	80	Keene (2009-11)	8.8	73	Keene

Figure 1.7: Ozone trends for the 8-hour NAAQS (2000-2015)
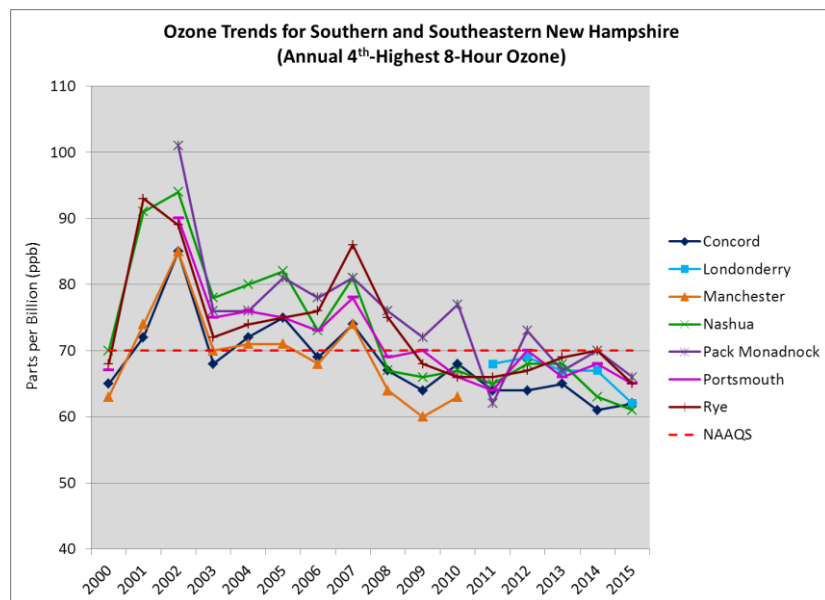
Figure 1.8: Ozone trends for the 8-hour NAAQS (2000-2015)
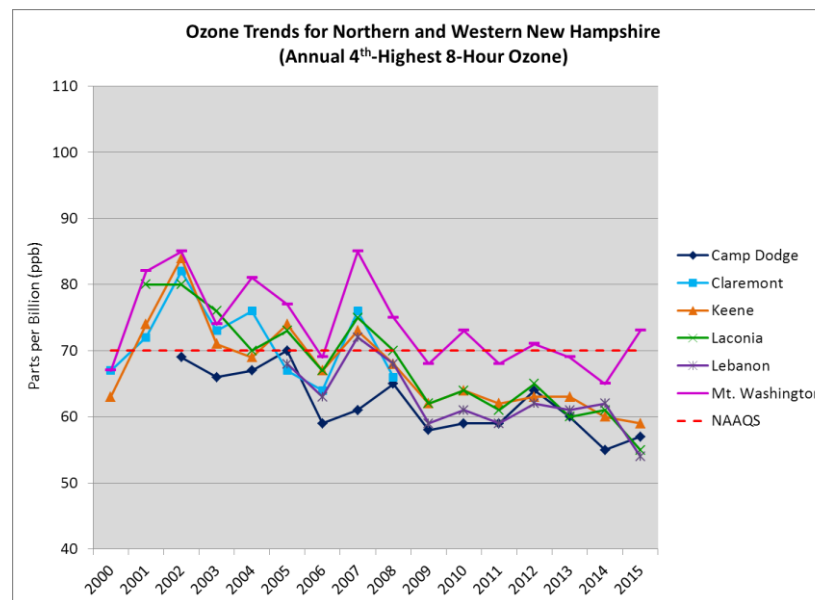
Figure 1.9: Carbon Monoxide trends for the 1-hour NAAQS (2000-2015)   **Figure 1.10: Carbon Monoxide trends for the 8-hour NAAQS (2000-2015)**
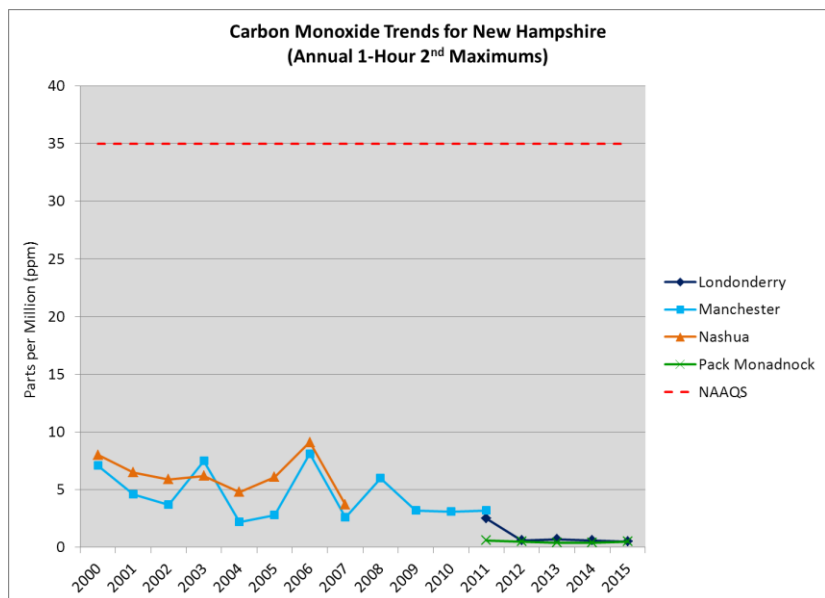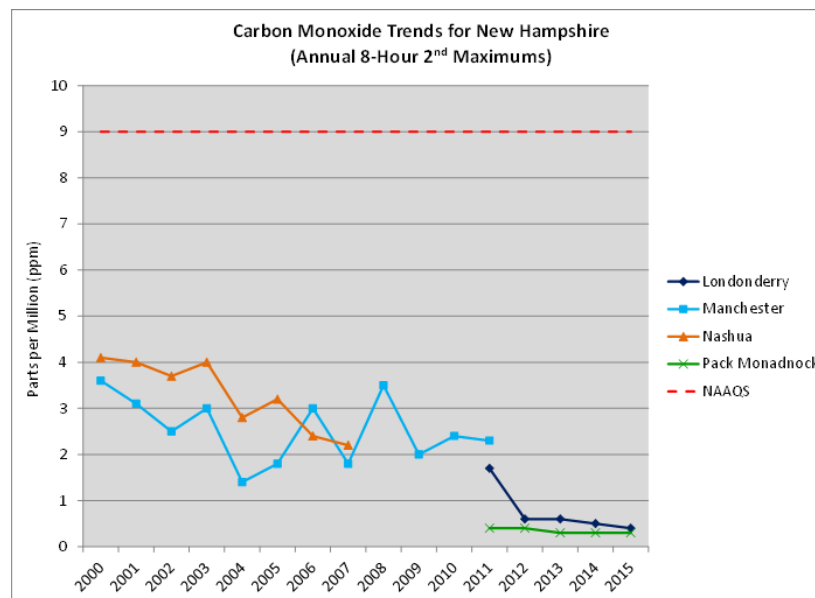
Figure 1.11: PM₂.₅ trends for the 24-hour NAAQS (2000-2015)

PM₂.₅ Trends for Southern and Southeastern New Hampshire (98th Percentiles)
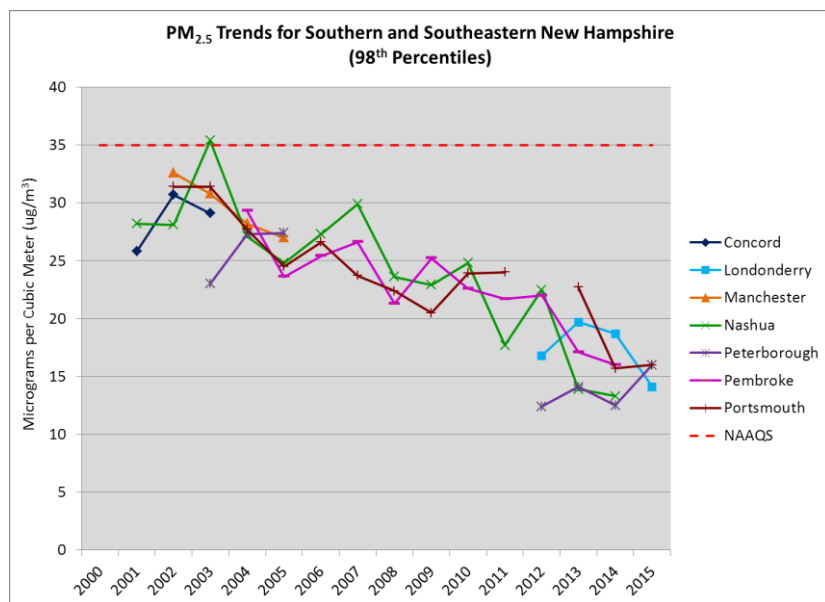
Figure 1.12: PM₂.₅ trends for the 24-hour NAAQS (2000-2015)

PM₂.₅ Trends for Northern and Western New Hampshire (98th Percentiles)
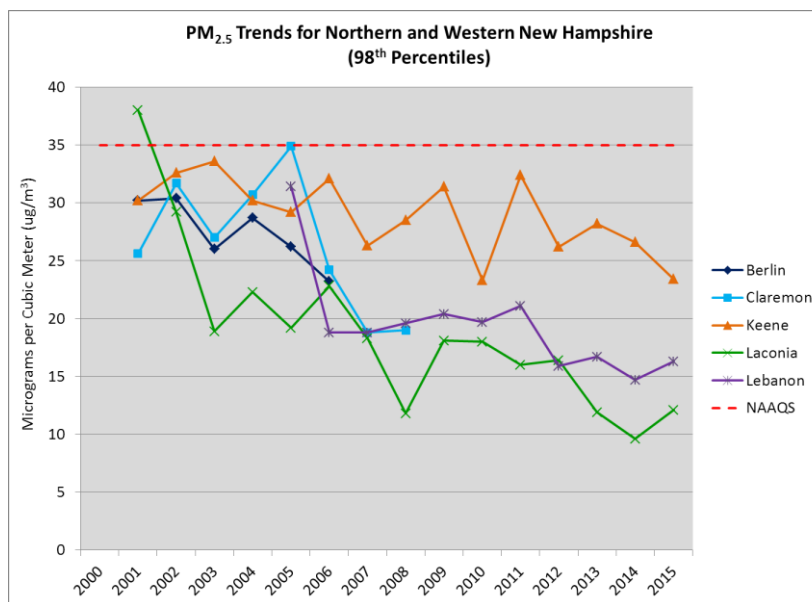
Figure 1.13: PM₂.₅ trends for the annual NAAQS (2000-2015)

PM₂.₅ Trends for Southern and Southeastern New Hampshire (Annual Means)
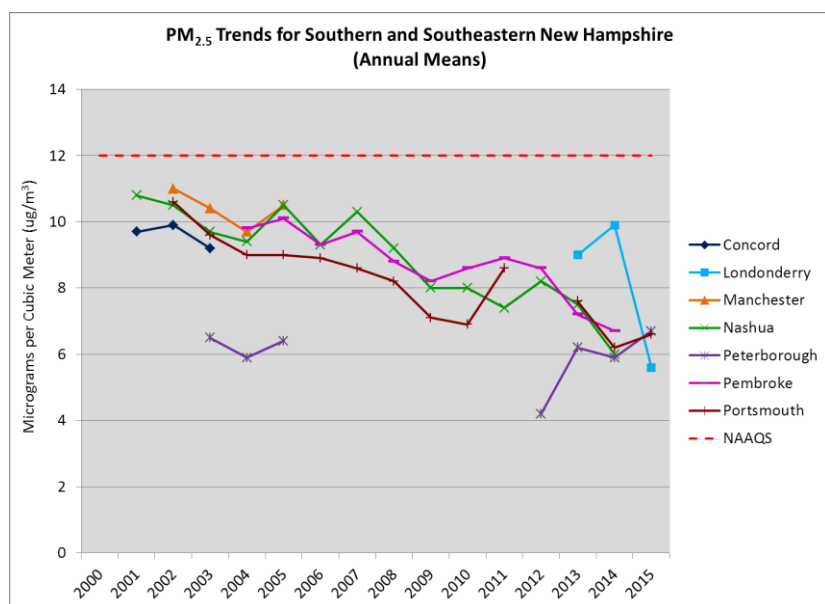
Figure 1.14: PM₂.₅ trends for the annual NAAQS (2000-2015)

PM₂.₅ Trends for Northern and Western New Hampshire (Annual Means)

Figure 1.15: Nitrogen Dioxide trends for the 1-hour NAAQS (2000-2015)

Figure 1.16: Lead trends for the annual NAAQS (2012-2015)

Figure 1.17: Sulfur Dioxide trends for the 1-hour NAAQS (2000-2015)

Figure 1.18: Sulfur Dioxide trends for the 3-hour NAAQS (2000-2015)

Figure 1.19: PM$_{10}$ trends for the 24-hour NAAQS (2000-2015)   **Figure 1.20: PM$_{10}$ trends for the 24-hour NAAQS (2000-2015)**
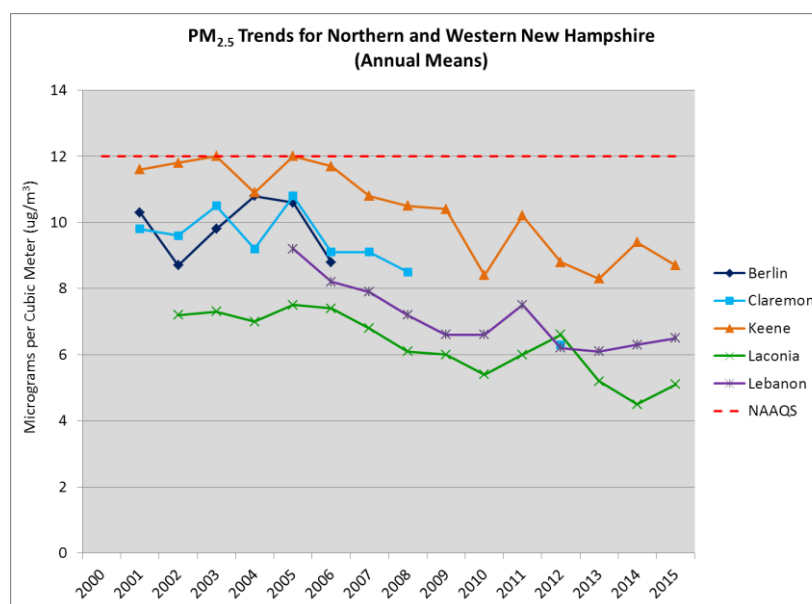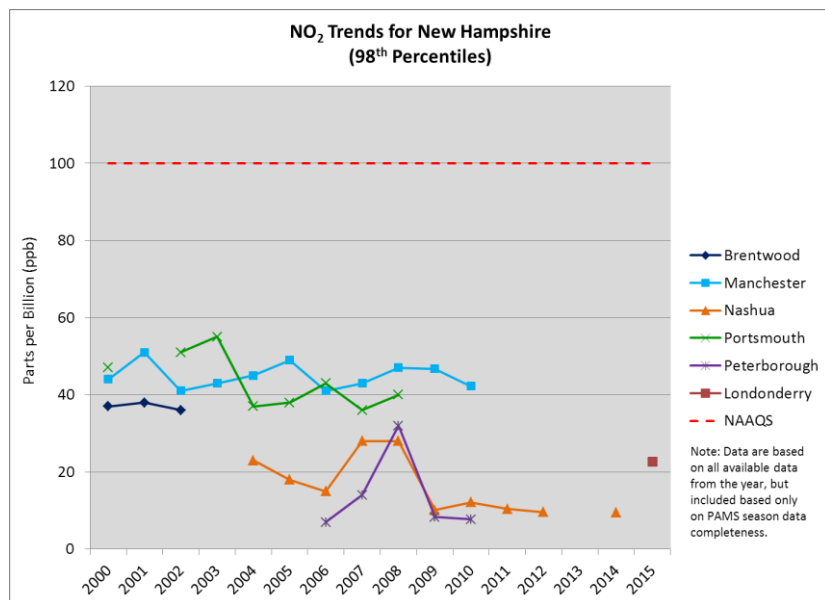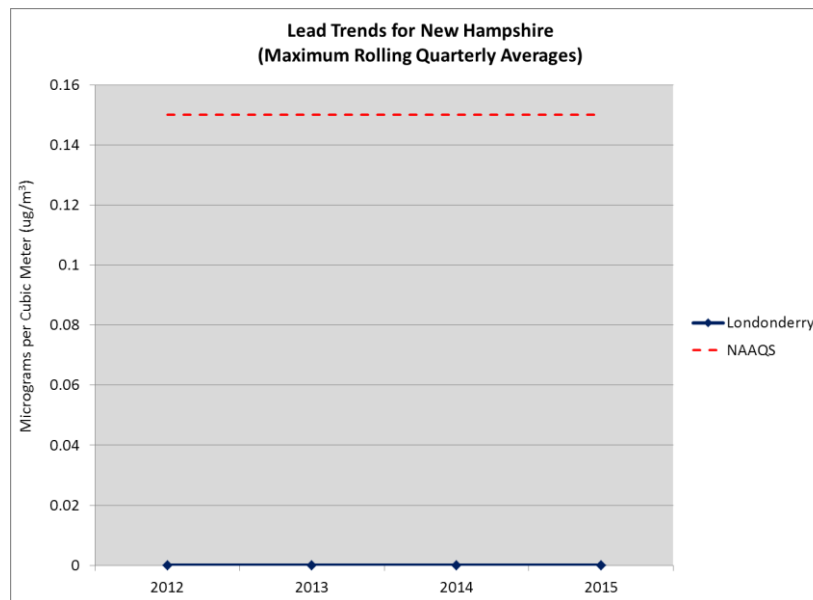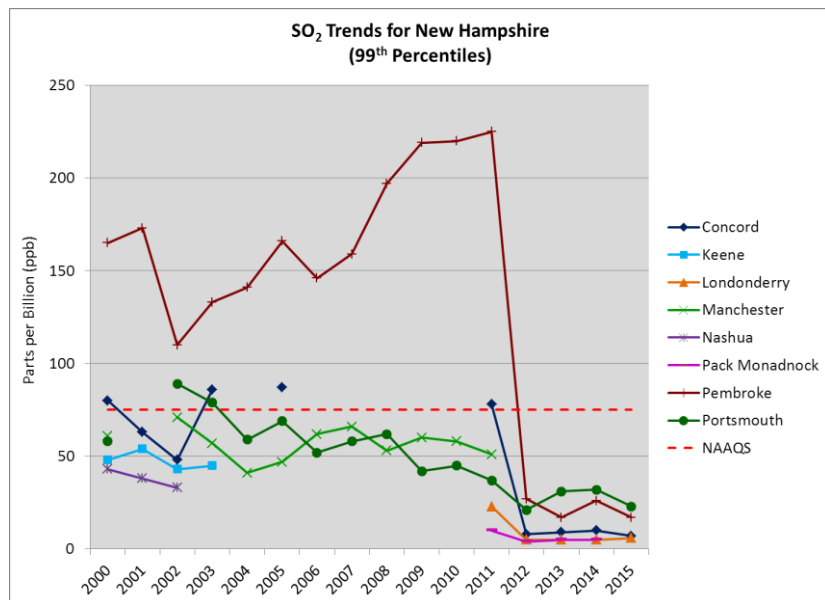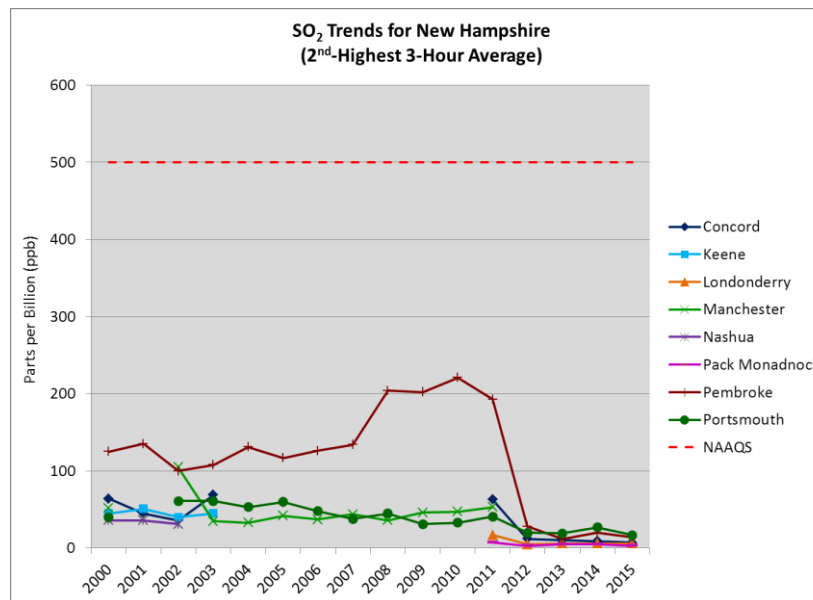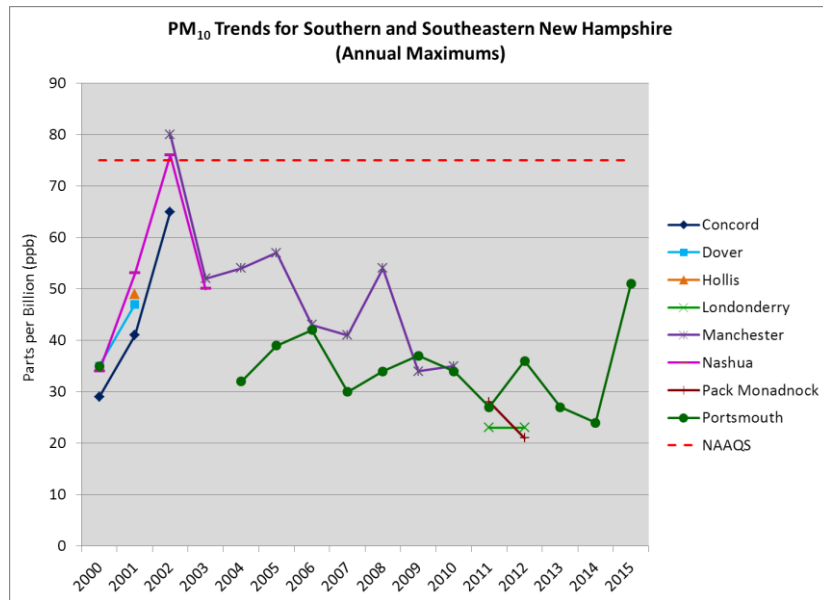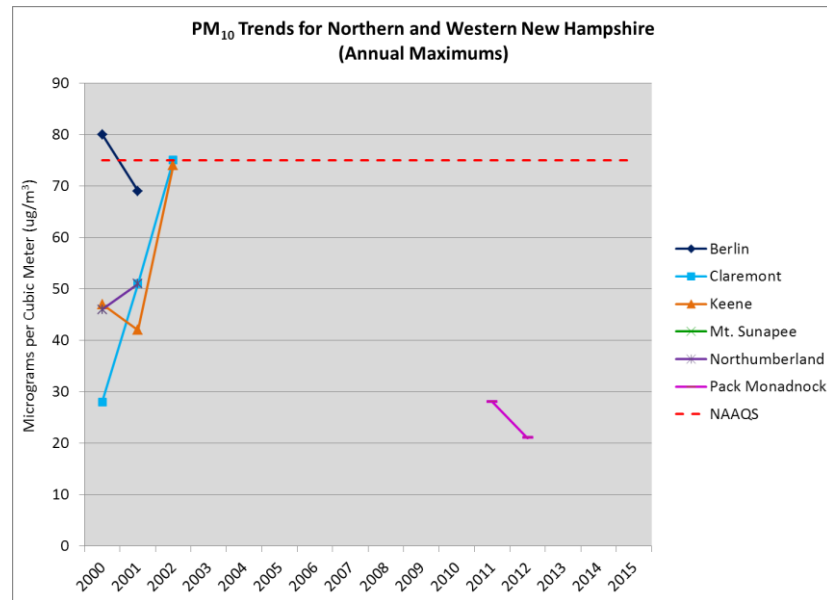
Table 1.8: New Hampshire State and Local Air Monitoring Stations Network – 2015/2016					
SO$_2$					
Town	Name	AIRS #	Frequency	Scale	Objective
Londonderry	Moose Hill School	33 015 0018	Continuous	Regional	Population
Pembroke	Pembroke Highway Dept.	33 013 1006	Continuous	Neighborhood	High Concentration
Peterborough	Pack Monadnock	33 011 5001	Continuous	Regional	Research
Portsmouth	Peirce Island	33 015 0014	Continuous	Neighborhood	Population
Concord	Hazen Drive	33 013 1007	Continuous	Neighborhood	Population
CO					
Town	Name	AIRS #	Frequency	Scale	Objective
Londonderry	Moose Hill School	33 015 0018	Continuous	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Continuous	Regional	Research
O$_3$					
Town	Name	AIRS #	Frequency	Scale	Objective
Concord	Hazen Drive	33 013 1007	April - Sept	Neighborhood	Population
Greens Grant	Camp Dodge	33 007 4002	April - Sept	Regional	Research
Keene	Water Street	33 005 0007	Continuous	Neighborhood	Population
Laconia	Lakes Region	33 001 2004	April - Sept	Regional	Population
Lebanon	Lebanon	33 009 0010	Continuous	Regional	Population
Londonderry	Moose Hill School	33 015 0018	Continuous	Regional	Population
Mount Washington	Mt. Washington Summit	33 007 4001	Continuous	Regional	Research
Nashua	Gilson Road	33 011 1011	April - Sept	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Continuous	Regional	Research
Portsmouth	Peirce Island	33 015 0014	Continuous	Neighborhood	Population
Rye, Odiorne	Seacoast Science Center	33 015 0016	April - Sept	Neighborhood	High Concentration
NO$_2$/NO$_y$					
Town	Name	AIRS #	Frequency	Scale	Objective
Londonderry NOy	Moose Hill School	33 015 0018	Continuous	Regional	Population
Londonderry NO$_2$	Moose Hill School	33 015 0018	Continuous	Regional	Population
Peterborough NOy	Pack Monadnock	33 011 5001	Continuous	Regional	Research

Table 1.9: New Hampshire Particulate Matter Network – 2015/2016					
PM$_{2.5}$					
Town	**Name**	**AIRS #**	**Frequency**	**Scale**	**Objective**
Keene	Water Street	33 005 0007	1 in 12 filter	Neighborhood	Population
Keene	Water Street	33 005 0007	Continuous - BAM	Neighborhood	Population
Laconia	Green Street	33 001 2004	1 in 6 filter	Regional	Population
Lebanon	Lebanon Airport	33 009 0010	1 in 12 filter	Neighborhood	Population
Lebanon	Lebanon Airport	33 009 0010	Continuous - BAM	Regional	Population
Londonderry	Moose Hill School	33 015 0018	1 in 3 filter	Regional	Population
Londonderry	Moose Hill School	33 015 0018	Continuous - BAM	Regional	Population
Londonderry	Moose Hill School	33 015 0018	1 in 6 filter	Regional	CoLocate Audit
Peterborough	Pack Monadnock	33 011 5001	Continuous - BAM	Regional	Research
Peterborough	Pack Monadnock	33 011 5001	1 in 3 filter	Regional	Research
Portsmouth	Peirce Island	33 015 0014	1 in 12 filter	Regional	Population
Portsmouth	Peirce Island	33 015 0014	Continuous - BAM	Regional	Population
PM$_{2.5}$ Speciation					
Peterborough	Pack Monadnock	33 011 5001	1 in 3 IMPROVE	Regional	Research
Londonderry	Moose Hill School	33 015 0018	1 in 3 IMPROVE	Regional	Population
PM10					
Londonderry	Moose Hill School	33 015 0018	1 in 3 filter	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Continuous - BAM	Regional	Research
Portsmouth	Peirce Island	33 015 0014	1 in 6 filter	Neighborhood	Population
Portsmouth	Peirce Island	33 015 0014	1 in 6 filter	Neighborhood	Audit
Portsmouth	Peirce Island	33 015 0014	Continuous - BAM	Neighborhood	Audit

Table 1.10: New Hampshire PAMS Network – 2015/2016					
Town	**Name**	**AIRS #**	**Frequency**	**Scale**	**Objective**
Londonderry	Moose Hill School	33 015 0018	Starting 2015 June - Sept	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	June - Sept	Regional	Research

Table 1.11: New Hampshire NCore Network – 2015/2016					
Town	**Name**	**AIRS #**	**Status**	**Scale**	**Objective**
Londonderry	Moose Hill School	33 015 0018	Operational on Jan 1, 2011	Regional	Population
Peterborough	Pack Monadnock	33 011 5001	Operational on Jan 1, 2011	Regional	Research

Table 1.12: Seasonal Maximum 24-hour Averages at Gilson Road in Nashua for Toxic PAMS Species Compared to the Ambient Allowable Limit (AAL), 2005-2014

PAMS Parameter	AAL ug/m3	Max 24 Hour Avg. (ug/m3)										Max as % of AAL
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
PROPYLENE (43205)	35,833	0.55	0.34	0.30	0.33	0.35	0.20	1.29	1.49	0.28	0.33	0.00%
CYCLOPENTANE (43242)	25,595	0.23	0.23	0.16	0.13	0.15	0.10	0.30	1.12	0.07	0.18	0.00%
ISOPENTANE (43221)	36,875	2.04	2.50	1.56	1.41	1.23	1.13	4.58	11.95	0.75	1.30	0.03%
PENTANE (43220)	36,875	3.13	1.39	0.85	0.74	0.76	0.61	1.99	6.05	0.47	0.84	0.02%
2-METHYLPENTANE (43285)	36,875	0.60	0.78	0.21	0.35	0.25	0.18	0.45	2.26	0.09	0.15	0.01%
3-METHYLPENTANE (43230)	36,875	0.41	0.48	0.20	0.30	0.20	0.25	0.44	1.65	0.09	0.13	0.00%
HEXANE (43231)	885	0.59	0.58	0.47	0.74	0.51	1.18	1.17	1.89	0.21	0.54	0.21%
BENZENE (45201)	6	0.51	0.74	0.36	0.42	0.37	0.29	1.11	1.23	0.21	0.86	21.65%
CYCLOHEXANE (43248)	6,000	0.25	0.21	0.21	0.48	0.19	0.29	0.41	0.47	0.06	0.16	0.01%
HEPTANE (43232)	8,249	0.56	0.34	0.18	0.32	0.25	0.12	0.43	1.37	0.07	0.21	0.02%
METHYLCYCLOHEXANE (43261)	23,958	0.21	0.21	0.11	0.16	0.10	0.06	0.30	0.85	0.03	0.15	0.00%
TOLUENE (45202)	5,000	2.37	2.67	1.39	1.97	1.60	1.77	2.18	5.10	0.67	1.75	0.10%
OCTANE (43233)	7,000	0.32	0.13	0.10	0.13	0.09	0.07	0.25	2.04	0.03	1.88	0.03%
ETHYLBENZENE (45203)	1,000	0.36	0.36	0.18	0.39	0.57	0.14	0.47	1.14	0.09	0.56	0.11%
M & P-XYLENES (45109)	1,550	0.88	0.96	0.68	1.15	2.04	0.45	1.22	3.49	0.24	1.07	0.22%
STYRENE (45220)	1,000	0.88	0.13	0.22	0.07	0.06	0.13	0.19	0.89	0.06	0.07	0.09%
O-XYLENE (45204)	1,550	0.32	0.36	0.26	0.40	0.40	0.16	0.56	1.26	0.10	0.51	0.08%
NONANE (43235)	15,625	0.21	0.13	0.21	0.10	0.11	0.07	0.33	0.35	0.04	2.08	0.00%
1,3,5-TRIMETHYLBENZENE (45207)	619	0.11	0.12	0.09	0.32	0.17	0.09	0.44	0.61	0.08	0.30	0.10%
1,2,4-TRIMETHYLBENZENE (45208)	619	0.32	0.39	0.32	0.39	0.31	0.18	0.47	1.25	0.19	0.21	0.20%

Table 1.13: Seasonal Maximum 24-hour Averages at Pack Monadnock in Miller State Park for Toxic PAMS Species Compared to the Ambient Allowable Limit (AAL), 2006-2014
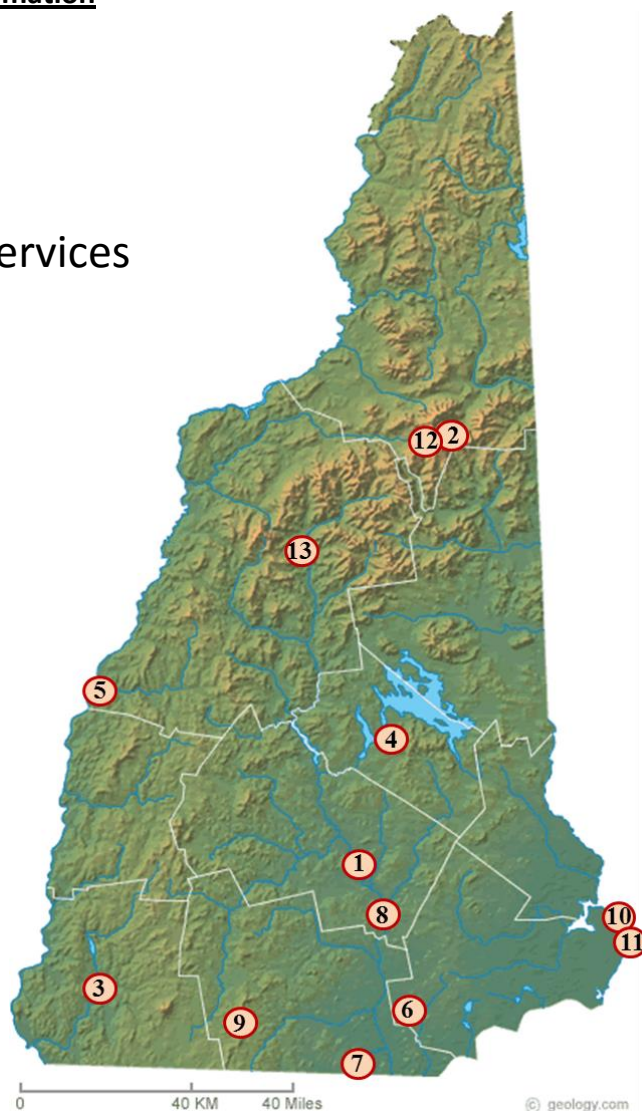
PAMS Parameter	AAL ug/m3	Max 24 Hour Avg. (ug/m3)									Max as % of AAL
		2006	2007	2008	2009	2010	2011	2012	2013	2014	
PROPYLENE (43205)	35,833	0.28	0.25	0.46	0.15	0.20	0.59	0.38	0.17	0.16	0.00%
CYCLOPENTANE (43242)	25,595	0.42	0.53	1.63	0.29	0.09	0.17	0.21	0.13	0.13	0.01%
ISOPENTANE (43221)	36,875	1.03	1.09	0.70	0.89	0.75	1.84	2.32	0.95	0.73	0.01%
PENTANE (43220)	36,875	45.41	7.63	0.55	0.45	0.38	0.86	0.76	0.48	0.40	0.12%
2-METHYLPENTANE (43285)	36,875	0.19	0.27	0.04	0.06	0.04	0.30	0.25	0.06	0.07	0.00%
3-METHYLPENTANE (43230)	36,875	0.13	0.17	0.01	0.04	0.03	0.21	0.19	0.03	0.02	0.00%
HEXANE (43231)	885	0.21	0.27	0.19	0.32	1.36	1.01	0.48	0.28	0.24	0.15%
BENZENE (45201)	6	0.31	0.33	0.32	0.41	0.73	1.09	0.45	0.38	0.41	19.18%
CYCLOHEXANE (43248)	6,000	0.14	0.05	0.02	0.08	0.04	0.48	0.15	0.06	0.04	0.01%
HEPTANE (43232)	8,249	0.71	0.16	0.15	0.17	0.13	0.79	0.21	0.14	0.11	0.01%
METHYLCYCLOHEXANE (43261)	23,958	1.23	0.15	0.15	0.11	0.16	0.49	0.14	0.07	0.06	0.01%
TOLUENE (45202)	5,000	1.00	1.05	1.11	1.01	0.77	2.48	1.36	0.80	0.56	0.05%
OCTANE (43233)	7,000	0.91	0.17	0.27	0.11	0.06	0.40	0.23	0.07	0.04	0.01%
ETHYLBENZENE (45203)	1,000	0.35	0.20	0.59	0.21	0.15	0.42	0.18	0.13	0.07	0.06%
M & P-XYLENES (45109)	1,550	1.88	0.37	2.38	0.46	0.23	1.22	0.42	0.42	0.19	0.15%
STYRENE (45220)	1,000	1.03	1.13	1.80	0.40	0.08	0.18	0.14	0.05	0.18	0.18%
O-XYLENE (45204)	1,550	0.60	0.13	0.67	0.15	0.08	0.45	0.20	0.16	0.08	0.04%
NONANE (43235)	15,625	8.83	1.33	0.57	0.23	0.08	0.16	0.20	0.36	0.05	0.06%
1,3,5-TRIMETHYLBENZENE (45207)	619	1.75	0.08	0.29	0.13	0.04	0.10	0.12	0.08	0.01	0.28%
1,2,4-TRIMETHYLBENZENE (45208)	619	3.91	1.34	0.79	0.53	0.14	0.38	0.26	0.08	0.09	0.63%

PART 2: Individual Station Information

New Hampshire
Department of Environmental Services

Air Resources Division

Air Quality Monitoring Stations
Summer 2016

Summer 2016	Ncore	IMPROVE	CASTNET	NADP	PAMS	Laboratory	Carbon Monoxide (CO)	Lead	Nitrogen Dioxide (NO2)	Nitrogen Oxides (NOy)	Ozone (O3)	PM2.5	PM2.5 co-location	PM10	PM10 co-location	PM Coarse	Sulfur Dioxide (SO2)	Wind Direction (WD)	Wind Speed (WS)	External Temperature (ETP)	Barometric Pressure (BP)	Relative Humidity (RH)	Precipitation (PT)	Solar Radiation (SolRad)
1. Concord						•					•						•(red)	•	•	•				
2. Greens Grant - Camp Dodge		•									•									•				
3. Keene											•	•						•	•	•				
4. Laconia											•	•	•(green)					•	•	•			•	
5. Lebanon											•	•						•	•	•				
6. Londonderry	•	•			•		•	•(red)	•	•	•	•	•(red)	•				•	•	•	•	•	•	
7. Nashua											•							•	•	•				
8. Pembroke																		•	•	•				
9. Peterborough - Pack Monadnock	•	•			•		•			•	•	•		•				•	•	•	•	•	•	•
10. Portsmouth											•	•		•	•			•		•				
11. Rye											•							•	•	•				
12. Sargents Purchase - Mt Washington Summit											•									•				
13. Woodstock - Hubbard Brook			•	•							•									•				

• proposed to be discontinued
• proposed to be added

Camp Dodge, Green's Grant

General Information			
AQS ID:	33-007-4002	Latitude:	44.308119
Town:	Green's Grant	Longitude:	-71.217658
Address:	Route 16	Elevation (m):	335
County:	Coos	Year Est.:	1995
Spatial Scale:	Regional		

Site Description

This air monitoring station is located in a rural forested area off Route 16 in Green's Grant. This wood clad, stick built shelter is approximately 7' wide by 10' long. This station is representative of a Class 1 Type Airshed. NHDES operates this station in cooperation with the Appalachian Mountain Club and the U.S. Forest Service.

Pollutants/Parameters

Ozone – Temperature – IMPROVE. The U.S. Forest Service operates the IMPROVE sampler.

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

Mt. Washington Summit

General Information				
AQS ID: Town: Address: County: Spatial Scale:	33-007-4001 Sargents Purchase Yankee Bld. Coos Regional	Latitude: Longitude: Elevation (m): Year Est.:	44.270086 -71.303844 1,917 1990	
Site Description				
This air monitoring station is located at the top of Mt. Washington in the Yankee Building.				
Pollutants/Parameters				
Ozone – Temperature				
Recent Changes				
NHDES did not make any significant changes to this station during this review period.				
Proposed/Planned Changes				
NHDES is not planning any significant changes to this station into the foreseeable future.				

Hubbard Brook, Woodstock

General Information			
AQS ID: Town: Address: County: Spatial Scale:	33-009-8001 Woodstock Mirror Lake Rd. Grafton Regional	Latitude: Longitude: Elevation (m): Year Est.:	43.944544 -71.700772 250 1989

Site Description	
This air monitoring station is located in a rural area in the White Mountain National Forest. This pre-fabricated structure is specifically designed for climate-controlled scientific operations. It measures approximately 8' wide by 10' long. An EPA Contractor operates this site.	

Pollutants/Parameters	
Ozone – Temperature – CASTNET	

Recent Changes	
NHDES did not make any significant changes to this station during this review period.	

Proposed/Planned Changes	
NHDES is not planning any significant changes to this station into the foreseeable future.	
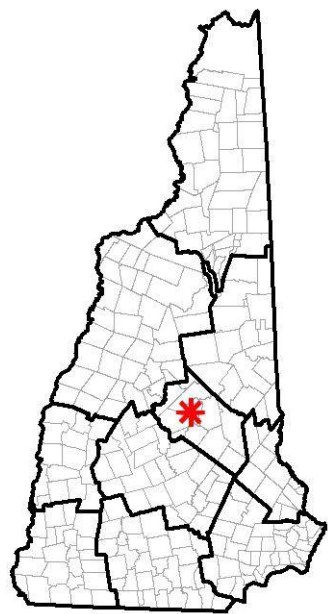
Lebanon Airport, Lebanon

General Information			
AQS ID: Town: Address: County: Spatial Scale:	33-009-0010 Lebanon Airport Road Grafton Neighborhood	Latitude: Longitude: Elevation (m): Year Est.:	43.6296 -72.309533 167 2005

Site Description
This 8' wide by 10' long insulated trailer is located at the northeast edge of the Lebanon Municipal Airport in a commercial area. The filter based PM$_{2.5}$ sampler is located on a deck on top of the trailer.

Pollutants/Parameters
Ozone - Continuous PM$_{2.5}$ (BAM) – filter based PM$_{2.5}$ (1 every 12 days) - Wind Speed - Wind Direction - Temperature

Recent Changes
NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes
NHDES is not planning any significant changes to this station into the foreseeable future.

Green Street, Laconia

General Information			
AQS ID:	33-001-2004	Latitude:	43.566111
Town:	Laconia	Longitude:	-71.496322
Address:	Green	Elevation (m):	216
County:	Street	Year Est.:	2001
Spatial Scale:	Belknap		
	Regional		

Site Description

This 10' wide by 12' long cedar clad, stick-built air monitoring station is located in an open field in a rural residential area. The filter-based PM$_{2.5}$ sampler is located on a platform approximately 30m from the structure.

Pollutants/Parameters

Ozone – filter based PM$_{2.5}$ (1 every 6 days) – Wind Speed – Wind Direction – Temperature - Precipitation

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES plans to establish a temporary winter PM$_{2.5}$ monitoring platform near downtown Laconia during the 2016-2017 winter season. Mobile monitoring conducted in 2012 indicated that there may be higher particle concentrations closer to the center of Laconia than where the FRM monitor is currently located.
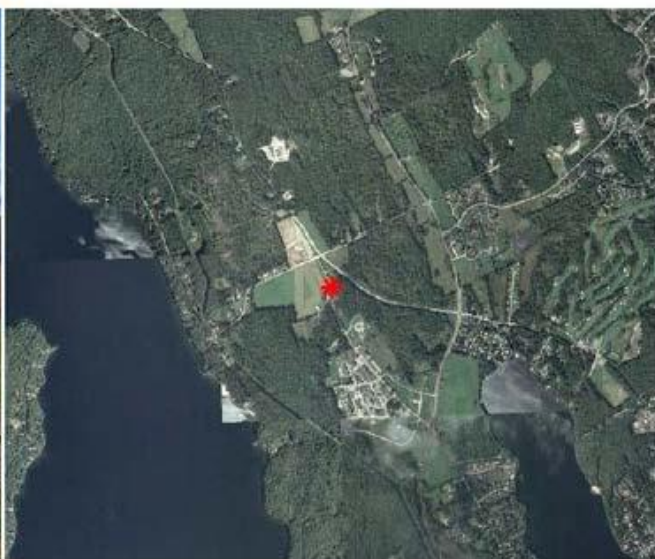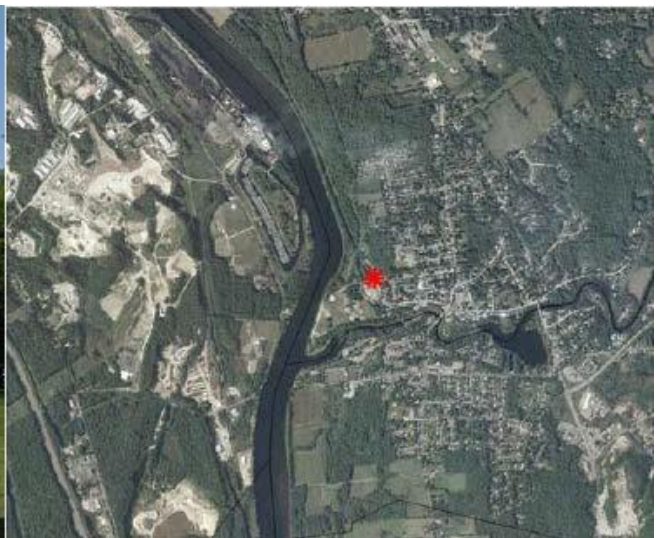
Hazen Station, Concord

General Information			
AQS ID: Town: Address: County: Spatial Scale:	33-013-1007 Concord 27 Hazen Dr. Merrimack Neighborhood	Latitude: Longitude: Elevation (m): Year Est.:	43.218478 -71.514533 100 2004

Site Description

This site has the advantage of being in close proximity to the NHDES main office, for both outreach opportunities and ease of maintenance. It is also in the proximity of residential neighborhoods, retirement communities and schools. The Station measures 8' wide by 18' long. Its insulated, box-type structure is specifically designed for climate-controlled scientific functions.

Pollutants/Parameters

Ozone – Sulfur Dioxide – Temperature – Wind Speed – Wind Direction. NHDES also uses this station as an air monitoring laboratory and a staging area for field-ready equipment.

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

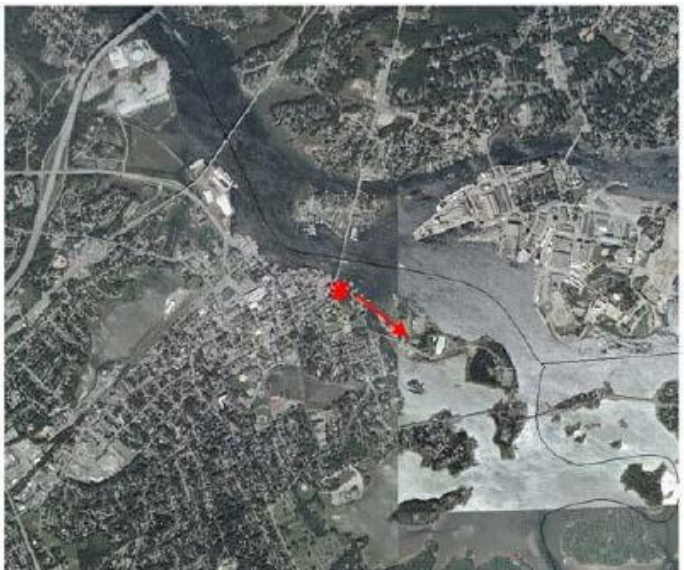NHDES is planning to discontinue SO_2 monitoring in Concord on December 31, 2016.

Exchange Street, Pembroke

General Information			
AQS ID: Town: Address: County: Spatial Scale:	33-013-1006 Pembroke Pleasant St. Merrimack Neighborhood	Latitude: Longitude: Elevation (m): Year Est.:	43.132444 -71.458270 100 2002

Site Description

This station is located in a suburban residential area southeast of the coal burning Merrimack station power plant. It is the ideal location for improving our understanding of near-field emissions from the Merrimack Station power plant. This insulated, box-type structure is specifically designed for climate-controlled scientific functions and measures approximately 8' wide by 10' long.

Pollutants/Parameters

Sulfur Dioxide – Temperature – Wind Speed – Wind Direction.

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

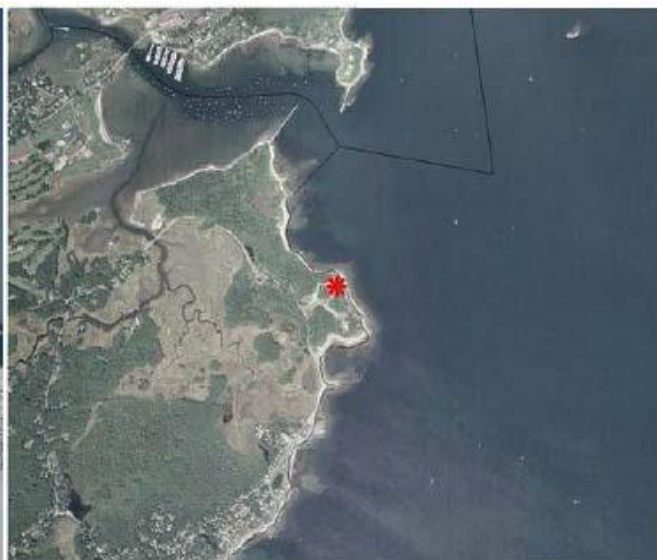NHDES is not planning any significant changes to this station into the foreseeable future.

Peirce Island, Portsmouth

General Information			
AQS ID: Town: Address: County: Spatial Scale:	33-015-0014 Portsmouth Peirce Island Rockingham Neighborhood	Latitude: Longitude: Elevation (m): Year Est.:	43.075367 -70.748014 4 2001

Site Description

This station is located in an urban commercial/residential area. It is strategically positioned to capture air quality data from the Portsmouth Shipyard (northeast), the urban center of Portsmouth (southwest), the industrialized Piscataqua River (northwest) and ocean fetch-type events (southeast) depending on wind direction. The cedar clad, stick built shelter is approximately 10' wide by 12' long. Filter based $PM_{2.5}$ samplers are located on platforms approximately 8m from the shelter.

Pollutants/Parameters

Ozone – $PM_{2.5}$ Continuous (BAM) – filter based $PM_{2.5}$ (1 every 12 days) – PM_{10} Continuous (BAM) – filter based PM_{10} (1 every 6 days) – filter based PM_{10} Colocation (1 every 6 days) – Sulfur Dioxide – Temperature – Wind Speed – Wind Direction

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES is planning to discontinue filter-based PM10 at this station on December 31, 2016. However NHDES will continue to operate one filter-based PM10 on a 12 day schedule as colocation for the PM10 BAM.
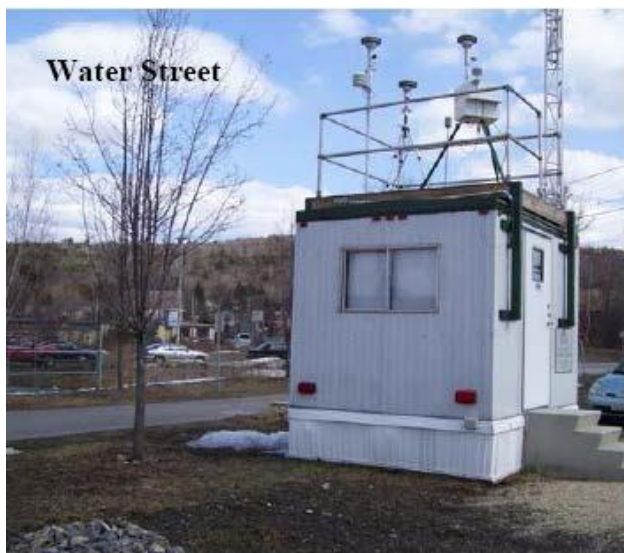
Seacoast Science Center, Rye

General Information				
AQS ID: Town: Address: County: Spatial Scale:	33-015-0016 Rye Seacoast Science Ctr. Rockingham Neighborhood	Latitude: Longitude: Elevation (m): Year Est.:	43.045267 -70.713953 10 2003	

Site Description

This station is located in a rural neighborhood on the Seacoast in direct exposure to the Atlantic Ocean. The station is located inside a modified corner of the main facility building at the Seacoast Science Center. NHDES established this station to measure coastal ozone episodes as well as to promote public understanding of air pollution and monitoring.

Pollutants/Parameters

Ozone - Temperature – Wind Speed – Wind Direction.

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.
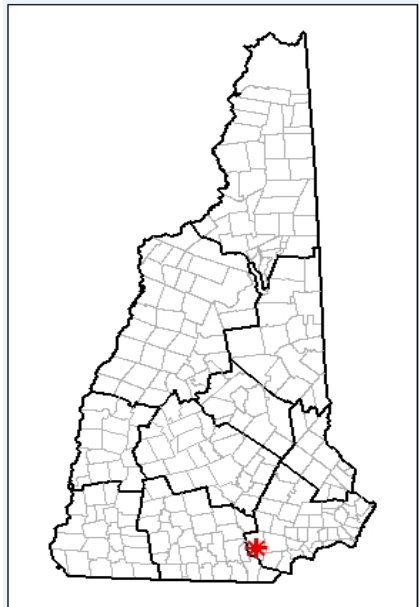
Water Street, Keene

General Information			
AQS ID: Town: Address: County: Spatial Scale:	33-005-0007 Keene Water Street Cheshire Neighborhood	Latitude: Longitude: Elevation (m): Year Est.:	42.930517 -72.272372 145 1989

Site Description
This 8' wide by 10' long air monitoring station is situated in a commercial area, close to the center of the city of Keene. The filter-based PM$_{2.5}$ sampler is located on the rooftop deck.

Pollutants/Parameters
Ozone - PM$_{2.5}$ Continuous (BAM) – filter based PM$_{2.5}$ (1 every 12 days) – Wind Speed - Wind Direction - Temperature

Recent Changes
NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes
NHDES is not planning any significant changes to this station into the foreseeable future.

Moose Hill, Londonderry

General Information			
AQS ID:	33-015-0018	Latitude:	42.862522
Town:	Londonderry	Longitude:	-71.380153
Address:	Moose Hill Sch.	Elevation (m):	104
County:	Rockingham	Year Est.:	2009
Spatial Scale:	Neighborhood		

Site Description

Proposed:

This 12' wide by 16' long wood clad, stick-built air monitoring station is located in a very open field in the heart of suburban New Hampshire, approximately halfway between the state's two largest cities (Manchester and Nashua). It has virtually zero local interferences from nearby pollution sources or obstructions, making it an ideal location to measure regional air quality. Filter-based $PM_{2.5}$ samplers are located on platforms approximately 15 m from the structure.

Pollutants/Parameters

NCORE: $PM_{2.5}$ Continuous (BAM) - filter based $PM_{2.5}$ (1 every 3 days) – IMPROVE – PM Coarse (1 every 3 days) – filter based PM_{10} (1 every 3 days) – Oxides of Nitrogen (NOy) – Nitrogen Dioxide (NO2) – Ozone – Sulfur Dioxide (trace) – Carbon Monoxide (trace) – Lead – Temperature – Wind Speed – Wind Direction – Relative Humidity – Precipitation – Barometric Pressure – Photochemical Precursors.

Recent Changes

NHDES initiated PAMS monitoring (from Nashua) and $PM_{2.5}$ filter-based colocation monitoring (from Pembroke) at this station on June 1, 2015 and January 1, 2015, respectively.

Proposed/Planned Changes

NHDES is planning to discontinue lead monitoring in Londonderry on July 1, 2016. NHDES is also planning to replace the filter-based PM10 at this station with a PM10 BAM on July 1, 2016.
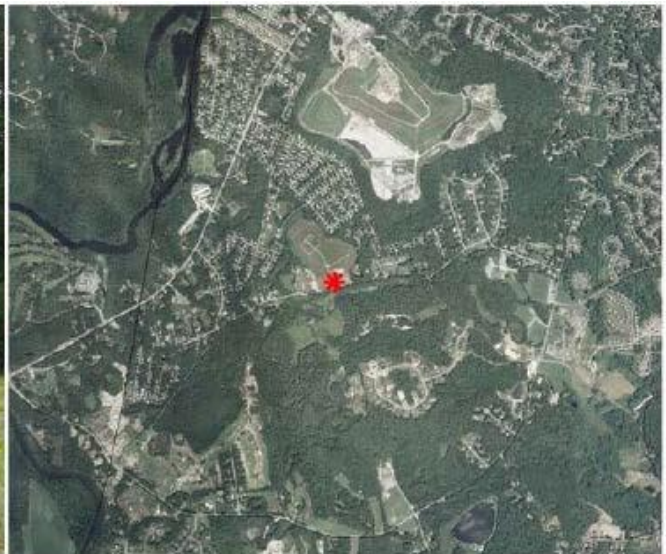
Pack Monadnock Mountain, Peterborough

General Information			
AQS ID:	33-011-5001	Latitude:	42.861901
Town:	Peterborough	Longitude:	-71.878613
Address:	Miller State Park	Elevation (m):	694.6
		Year Est.:	2002
County:	Hillsborough		
Spatial Scale:	Regional		

Site Description

This station is located in an elevated forest environment on the summit of Pack Monadnock Mountain. NHDES recently renovated this 27' by 10' structure to include many efficiency initiatives. The location of this station is scientifically significant because it is the highest accessible peak that lies directly within the primary air pollution transport corridor into the central part of the state. This makes the site the ideal location for improving our understanding of air pollution transport into the heavily populated Merrimack Valley and beyond. The filter-based $PM_{2.5}$ sampler is located on a deck on top of the structure.

Pollutants/Parameters

NCORE: $PM_{2.5}$ Continuous (BAM) - filter based $PM_{2.5}$ (1 every 3 days) – IMPROVE – PM Coarse (1 every 3 days) – filter based PM_{10} (1 every 3 days) – Oxides of Nitrogen (NOy) – Ozone – Sulfur Dioxide (trace) – Carbon Monoxide (trace) – Temperature – Wind Speed – Wind Direction – Relative Humidity – Precipitation – Barometric Pressure – Solar Radiation – Photochemical Precursors.

Recent Changes

NHDES started a continuous PM10 BAM at this station in the 1st Quarter 2015 and subsequently shut down PM10 filter based sampling.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.

Gilson Road, Nashua

General Information			
AQS ID:	33-011-1011	Latitude:	42.718656
Town:	Nashua	Longitude:	-71.522428
Address:	57 Gilson Rd.	Elevation (m):	59
County:	Hillsborough	Year Est.:	2003
Spatial Scale:	Neighborhood		

Site Description

This air monitoring station is located in a suburban residential neighborhood near a Superfund site. NHDES requires two 8' wide by 16' long trailers to accommodate the equipment needed to measure ambient air parameters, including PAMS. NHDES collects meteorological data from a tower located on an adjacent building. Photochemical Assessment Monitoring (PAMS) was previously conducted at this station. NHDES moved PAMS to Londonderry in 2014. PAMS canister preparation still takes place at this station.

Pollutants/Parameters

Ozone – Temperature – Wind Speed – Wind Direction.

Recent Changes

NHDES did not make any significant changes to this station during this review period.

Proposed/Planned Changes

NHDES is not planning any significant changes to this station into the foreseeable future.
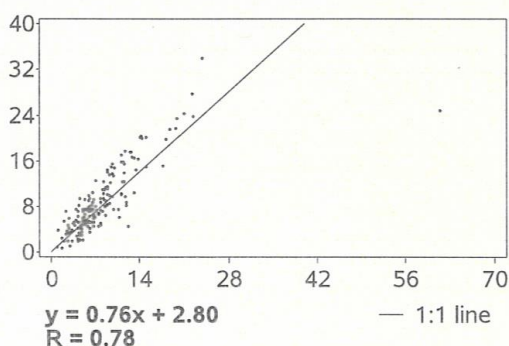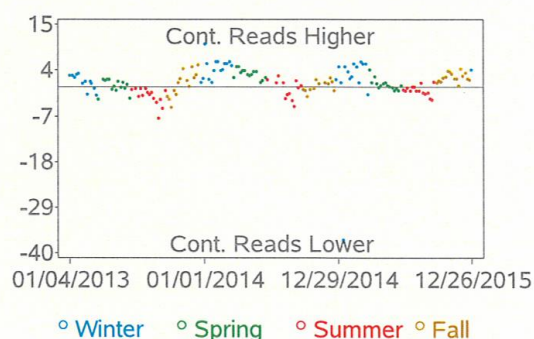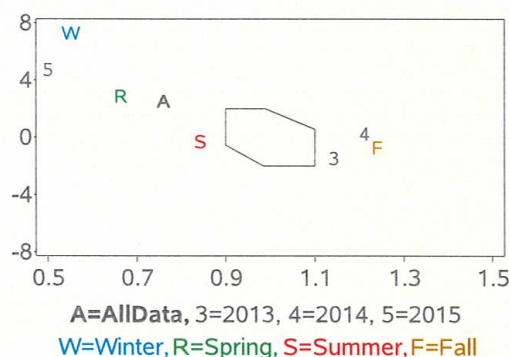
APPENDIX A:
PM$_{2.5}$ Comparability Assessment

PM$_{2.5}$ Continuous Monitor Comparability Assessment
Site 33-005-0007: Keene, NH

FRM: BGI Models PQ200-VSCC or PQ200A-VSCC - Gravimetric (142,116), PM2.5 - Local Conditions (88101), POC=1
Cont: Met One BAM-1020 Mass Monitor w/VSCC - Beta Attenuation (170), PM2.5 - Local Conditions (88101), POC=3

Cont. (y) vs. FRM (x) PM$_{2.5}$ ($\mu g/m^3$)

$y = 0.76x + 2.80$
$R = 0.78$

— 1:1 line

Cont. minus FRM PM$_{2.5}$ ($\mu g/m^3$)

Cont. Reads Higher
Cont. Reads Lower

01/04/2013   01/01/2014   12/29/2014   12/26/2015

° Winter   ° Spring   ° Summer   ° Fall

Additive (y) vs. Multiplicate (x) Bias

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

Mean PM$_{2.5}$ ($\mu g/m^3$)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	170	8.1	8.9	1.11
Winter	43	12.0	14.2	1.18
Spring	43	5.7	6.9	1.21
Summer	42	7.6	6.3	0.84
Fall	42	7.0	8.1	1.17
2013	57	8.1	7.9	0.99
2014	53	7.4	9.5	1.28
2015	60	8.6	9.3	1.08

Appendix A Statistics

Dataset	N	Bias (all observations)	N	Bias (only >= 3 ug/m^3)
AllData	170	15.1	147	15.4
Winter	43	26.6	41	28.7
Spring	43	35.3	38	20.2
Summer	42	-17	35	-10
Fall	42	14.8	33	20.8
2013	57	-4.6	49	1.2
2014	53	36.8	44	29.8
2015	60	14.7	54	16.6

Data Source: EPA AQS Data Mart

Generated on: May 31, 2016

PM $_{2.5}$ Continuous Monitor Comparability Assessment
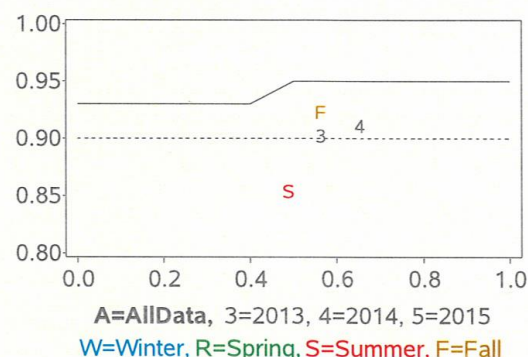## Site 33-009-0010: Lebanon, NH

FRM: BGI Models PQ200-VSCC or PQ200A-VSCC - Gravimetric (142,116), PM2.5 - Local Conditions (88101), POC=1
Cont: Met One BAM-1020 Mass Monitor w/VSCC - Beta Attenuation (170), PM2.5 - Local Conditions (88101), POC=3

Cont. (y) vs. FRM (x) PM $_{2.5}$ (μg/m^3)

$y = 1.11x + -0.30$
$R = 0.88$

— 1:1 line

Cont. minus FRM PM $_{2.5}$ (μg/m^3)

Cont. Reads Higher

Cont. Reads Lower

01/04/2013   12/30/2013   12/25/2014   12/20/2015

○ Winter   ○ Spring   ○ Summer ○ Fall

Additive (y) vs. Multiplicate (x) Bias

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

Mean PM $_{2.5}$ (μg/m^3)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	85	6.3	6.6	1.06
Winter	22	6.3	7.2	1.14
Spring	21	4.9	4.7	0.94
Summer	22	7.9	8.7	1.10
Fall	20	5.8	5.9	1.01
2013	28	6.5	6.4	0.98
2014	28	5.7	6.2	1.09
2015	29	6.6	7.3	1.11

Appendix A Statistics

Dataset	N	Bias (all observations)	N	Bias (only >= 3 ug/m^3)
AllData	85	3.3	71	12.2
Winter	22	7.1	18	16.3
Spring	21	-6.3	18	2.6
Summer	22	10.0	20	17.3
Fall	20	1.8	15	11.9
2013	28	-6.1	24	0.1
2014	28	6.6	22	19.0
2015	29	9.2	25	17.8

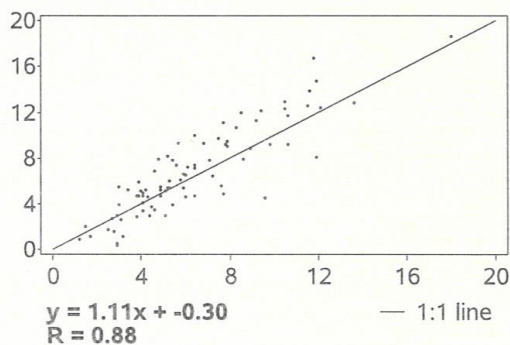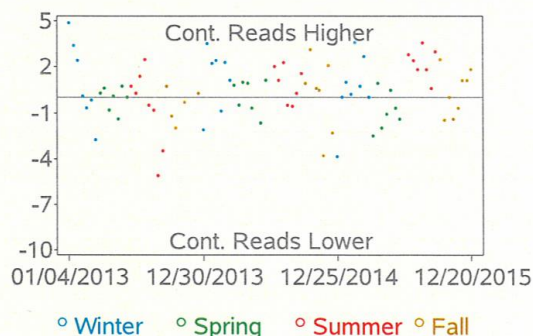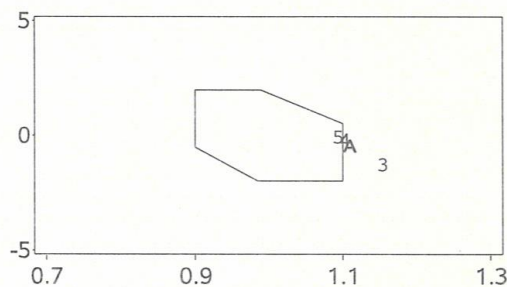Data Source: EPA AQS Data Mart

Generated on: May 31, 2016

PM 2.5 Continuous Monitor Comparability Assessment
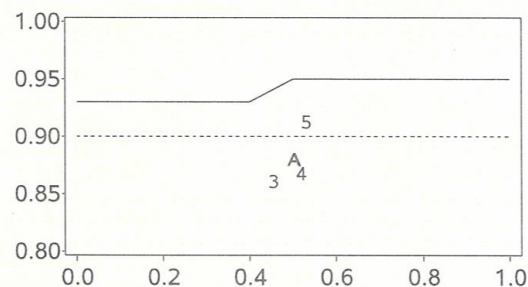## Site 33-015-0018: Not in a City, NH

FRM: BGI Models PQ200-VSCC or PQ200A-VSCC - Gravimetric (142,145,) - PM2.5 - Local Conditions (88101), POC=1
Cont: Met One BAM-1020 Mass Monitor w/VSCC - Beta Attenuation (170), PM2.5 - Local Conditions (88101), POC=3

Cont. (y) vs. FRM (x) PM$_{2.5}$ (μg/m^3)

$y = 0.59x + 4.22$
$R = 0.56$
— 1:1 line

Cont. minus FRM PM$_{2.5}$ (μg/m^3)

Cont. Reads Higher
Cont. Reads Lower

01/25/2012   01/16/2013   01/08/2014   12/31/2014

○ Winter   ○ Spring   ○ Summer   ○ Fall

Additive (y) vs. Multiplicate (x) Bias

A=AllData, 2=2012, 3=2013, 4=2014
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)

A=AllData, 2=2012, 3=2013, 4=2014
W=Winter, R=Spring, S=Summer, F=Fall

Mean PM$_{2.5}$ (μg/m^3)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	246	6.3	8.0	1.26
Winter	62	6.1	9.3	1.51
Spring	71	5.4	6.7	1.23
Summer	55	8.2	6.8	0.83
Fall	58	5.9	9.3	1.57
2012	106	6.9	6.5	0.94
2013	86	6.3	8.6	1.35
2014	54	5.2	9.9	1.91

Appendix A Statistics

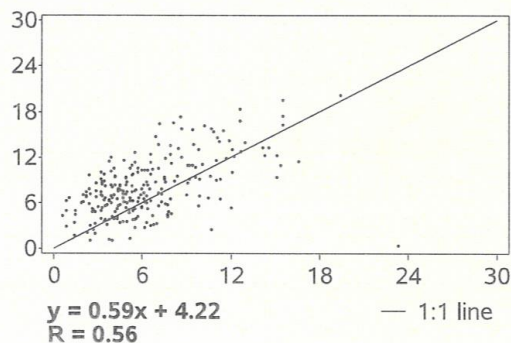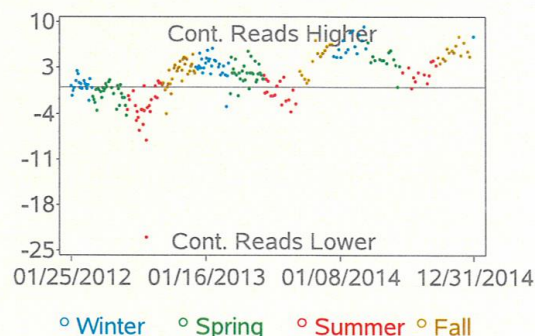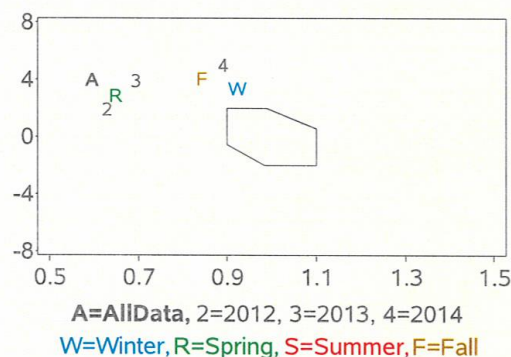| Dataset	N (all observations)	Bias (all observations)	N (only >= 3 ug/m^3)	Bias (only >= 3 ug/m^3)
AllData	246	52.5	207	35.9
Winter	62	65.8	56	58.5
Spring	71	54.9	56	27.7
Summer	55	-7.4	48	-4.2
Fall	58	92.2	47	59.4
2012	106	3.3	90	3.4
2013	86	59.1	72	39.9
2014	54	139	45	94.4

Data Source: EPA AQS Data Mart

Generated on: May 31, 2016

PM 2.5 Continuous Monitor Comparability Assessment
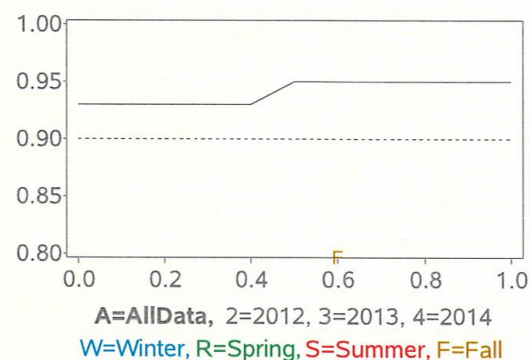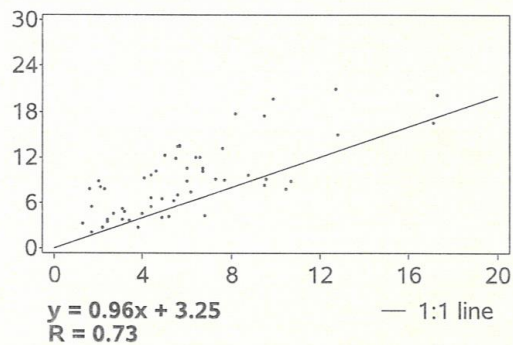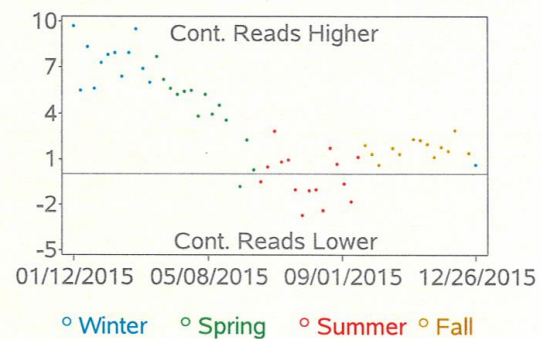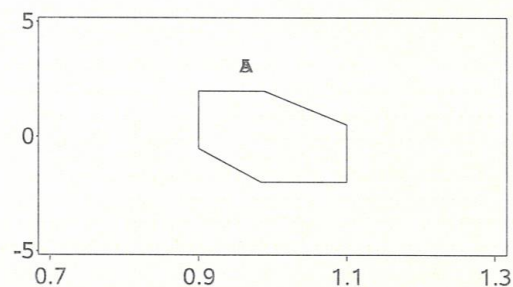## Site 33-015-0018: Not in a City, NH

FRM: BGI Models PQ200-VSCC or PQ200A-VSCC - Gravimetric (142,145,), PM2.5 - Local Conditions (88101), POC=1
Cont: Met-one BAM-1020 W/PM2.5 SCC - Beta Attenuation (170), Acceptable PM2.5 AQI & Speciation Mass (88502), POC=3

Cont. (y) vs. FRM (x) PM$_{2.5}$ (μg/m^3)

$y = 0.96x + 3.25$
$R = 0.73$
— 1:1 line

Cont. minus FRM PM$_{2.5}$ (μg/m^3)

Cont. Reads Higher
Cont. Reads Lower
01/12/2015 05/08/2015 09/01/2015 12/26/2015

° Winter   ° Spring   ° Summer   ° Fall

Additive (y) vs. Multiplicate (x) Bias

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)
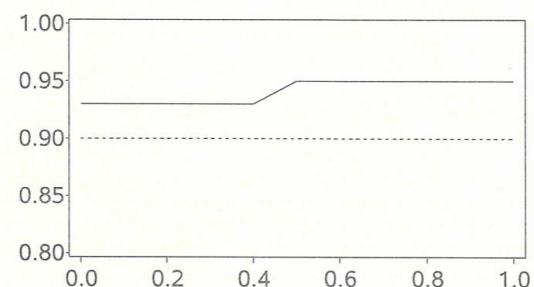
A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

Mean PM$_{2.5}$ (μg/m^3)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	55	6.0	9.0	1.51
Winter	13	6.5	13.4	2.06
Spring	14	5.1	9.3	1.81
Summer	15	7.9	7.7	0.98
Fall	13	4.2	5.9	1.40
2013	0	.	.	.
2014	0	.	.	.
2015	55	6.0	9.0	1.51

Appendix A Statistics

Dataset	N	Bias (all observations)	N	Bias (only >= 3 ug/m^3)
AllData	55	73.0	43	50.6
Winter	13	131	11	98.0
Spring	14	116	11	70.8
Summer	15	0.7	13	0.5
Fall	13	51.5	8	39.2
2013	0	.	.	.
2014	0	.	.	.
2015	55	73.0	43	50.6

Data Source: EPA AQS Data Mart

Generated on: May 31, 2016

PM 2.5 Continuous Monitor Comparability Assessment
Site 33-011-5001: Peterborough (Peterboro), NH

FRM: R & P Model 2025 PM-2.5 Sequential Air Sampler w/VSCC - Gravimetric (145,118,), PM2.5 - Local Conditions (88101), POC=1
Cont: Met One BAM-1020 Mass Monitor w/VSCC - Beta Attenuation (170), PM2.5 - Local Conditions (88101), POC=3

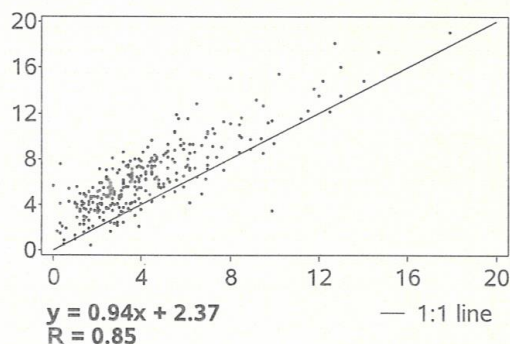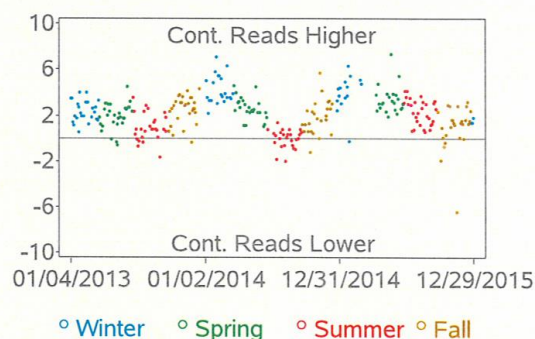### Cont. (y) vs. FRM (x) PM$_{2.5}$ ($\mu g/m^3$)

$y = 0.94x + 2.37$
$R = 0.85$
— 1:1 line

Cont. minus FRM PM$_{2.5}$ ($\mu g/m^3$)

Cont. Reads Higher

Cont. Reads Lower

01/04/2013   01/02/2014   12/31/2014   12/29/2015

° Winter   ° Spring   ° Summer   ° Fall

Additive (y) vs. Multiplicate (x) Bias

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall
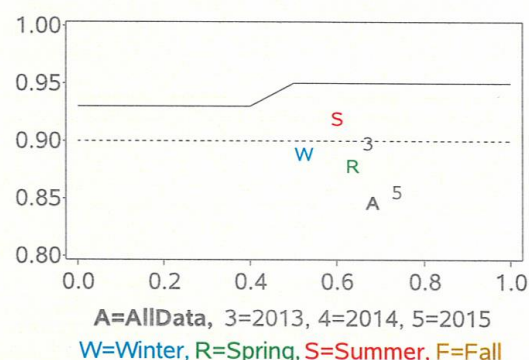
Mean PM$_{2.5}$ ($\mu g/m^3$)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	306	4.2	6.3	1.51
Winter	63	3.8	7.1	1.87
Spring	78	3.7	6.3	1.68
Summer	83	5.8	7.0	1.19
Fall	82	3.1	4.9	1.57
2013	110	4.1	6.0	1.47
2014	102	4.0	6.1	1.52
2015	94	4.3	6.7	1.55

Appendix A Statistics

Dataset	N	Bias (all observations)	N	Bias (only >= 3 ug/m^3)
AllData	306	91.3	186	45.5
Winter	63	109	36	77.1
Spring	78	147	53	55.8
Summer	83	33.9	64	22.2
Fall	82	82.3	33	39.7
2013	110	77.8	65	37.7
2014	102	74.3	63	49.4
2015	94	125	58	50.0

Data Source: EPA AQS Data Mart

Generated on: May 31, 2016

PM 2.5 Continuous Monitor Comparability Assessment
Site 33-015-0014: Portsmouth, NH

FRM: BGI Models PQ200-VSCC or PQ200A-VSCC - Gravimetric (142,116,), PM2.5 - Local Conditions (88101), POC=1
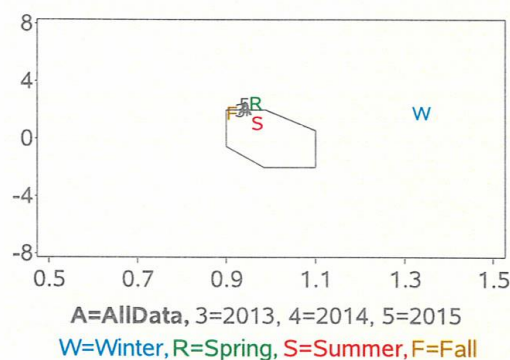Cont: Teledyne Model 602 Beta plus w/VSCC - Beta Attenuation (204), PM2.5 - Local Conditions (88101), POC=6

Cont. (y) vs. FRM (x) PM$_{2.5}$ (μg/m^3)

$y = 1.10x + -0.52$
$R = 0.96$
— 1:1 line

Cont. minus FRM PM$_{2.5}$ (μg/m^3)

Cont. Reads Higher
Cont. Reads Lower

09/13/2013 06/18/2014 03/23/2015 12/26/2015

○ Winter   ○ Spring   ○ Summer   ○ Fall

Additive (y) vs. Multiplicate (x) Bias

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

R (y) vs. FRM CCV (x)

A=AllData, 3=2013, 4=2014, 5=2015
W=Winter, R=Spring, S=Summer, F=Fall

Mean PM$_{2.5}$ (μg/m^3)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	104	6.2	6.4	1.02
Winter	15	6.5	7.6	1.18
Spring	18	4.8	5.0	1.05
Summer	32	7.8	8.1	1.03
Fall	39	5.5	5.1	0.92
2013	12	6.4	6.1	0.95
2014	35	5.5	5.3	0.95
2015	57	6.6	7.1	1.07

Appendix A Statistics

Dataset	N	Bias (all observations)	N	Bias (only >= 3 ug/m^3)
AllData	104	0.0	84	3.1
Winter	15	14.7	13	16.1
Spring	18	4.0	13	6.4
Summer	32	2.0	31	1.8
Fall	39	-9.2	27	-3.3
2013	12	-8.2	9	-2.6
2014	35	-5.5	27	-4.5
2015	57	5.0	48	8.4

Data Source: EPA AQS Data Mart

Generated on: May 31, 2016